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NESTING IN WESTERN INDIA.

By Lieut. H. E. Barnes.

(*Continued from page* 255, *Vol. IV.*)

475.—THE MAGPIE ROBIN.

Copsychus saularis, Lin.

The Magpie Robin is another species that appears to be rare, if not altogether absent from Sind; it occurs sparingly in Guzerat, becomes much more common in the Deccan, and is most abundant in Ratnagiri and the Southern parts of the district generally.

As a rule they are permanent residents where they occur, but I never succeeded in finding a nest in the neighbourhood of Deesa, but Mr. Littledale has found several at and near Baroda. In all the other parts of Western India it is a common breeder.

The breeding season lasts from early in May to about the middle of July, but nests may be found both earlier and later than this.

The nests are generally placed in holes in trees, occasionally in holes in walls, &c., and are composed of grass roots, vegetable fibres, moss, &c. It is a shallow saucer in shape, often a mere pad, and the eggs, five in number, sometimes only four, much more rarely six, are as a rule oval in shape and pale greenish-white in colour, but are subject to much variation both in shape and colour; they are

streaked, spotted, speckled, and blotched with various shades of brownish-red. One clutch I have is a pale sea-green, sparingly but beautifully blotched with reddish-brown, and having smudges of faint inky purple at the larger end. In another clutch the ground-colour is a bluish-green. The markings are usually much more numerous at the larger end, where they often form an imperfect zone or cap. Often the markings are so thick as to leave little of the ground colour visible.

They vary much in size, but the average is 0·87 inches in length by rather more than 0·66 in breadth.

Mr. Davidson tells me that, according to his experience, this bird seems to breed only in the West part of the Presidency; thus, he has taken its nest in Satara and the western talukas of Nassick, never in Khandeish, Sholapur, or the eastern Nassick talukas. In Kanara it swarms, breeding from the middle of March to the rains.

After the eggs are hatched, the birds are very quarrelsome, boldly attacking any other bird or animal that approaches the nest.

The young are easily reared by placing them in a cage accessible to the parent birds, who will attend and feed them in the same way that the Golden Oriole does. They have a sweet song, which is heard to most advantage in the early morning during the breeding season.

Poona, April to June.			*H. E. Barnes.*
Bombay, 18th March to June.			,,
Satara,	*Middle of March to June.*		*J. Davidson, C.S.*
Western Nassick,	,,	,,	,,
Kanara,	,,	,,	,,
Baroda,	,,	,,	*H. Littledale, B.A.*

476.—THE SHAMA.

Cercotrichas macrura, Gm.

The Shama only occurs in the southern portion of the Presidency, where it is a permanent resident, but I can find no record of a nest having actually been taken there.

Mr. Davidson notes—"Common though this bird is in the above ghat portion of Kanara, from March to May, and probably all the year, I not only never got a nest (the birds were then breeding), but I never managed to shoot a hen-bird."

According to Mr. Hume's *Nests and Eggs of Indian Birds*, page 306, they breed during April and May in holes in trees, making a large nest of leaves and twigs, lined with fine twigs, and laying three eggs moderately broad oval in shape, a good deal pointed at one end, and exhibiting a slight pyriform tendency. The shell, which has a slight gloss, is fine and compact. The ground colour is dull greenish-stone (but very little of it is visible), and it is everywhere very densely freckled, in some rather streakily, with a rich, almost raw, sienna-brown, in amongst which dull purplish markings are, when the egg is closely looked into, found to be thickly mingled. The combined effect, when looked into at a little distance, is of a dense ruddy purplish-brown mottling.

The eggs vary from 0·87 to 0·9 inches in length, and from 0·6 to 0·62 in breadth. They are small for the size of the bird. As Mr. Hume remarks, they remind one of some of the Lark's eggs.

479.—THE INDIAN BLACK ROBIN.

Thamnobia fulicata, Lin.

It is considered doubtful by many whether the Indian Black Robin is distinct from the Northern Indian Robin (*Thamnobia cambaiensis, Lath.*) It is hard at times to distinguish between them: typical specimens are of course widely different, but many intermediate forms occur linking them together, but so long as the Black and Painted Partridges, the Dark Ashy, and Stewards' Wren Warblers, and many others are considered entitled to specific distinction, these also must be retained. I cannot attempt to define the limits of each, but generally speaking, typical *fulicata* occurs in the south and *cambaiensis* in the north, but it is difficult, in fact impossible, to draw any hard and fast line between them.

They breed from April to the middle of July. The nest is a mere pad composed of grass stems and roots, vegetable fibres, cotton, moss, &c., lined with hair and feathers, and is placed in a hole in a wall or bank, on ledges of rock, and occasionally between the roots of trees; very rarely is the nest placed in a bush; in this latter case it is much more neatly and compactly made, and is cup-shaped.

The eggs, usually three in number, sometimes four, more rarely only two, are moderately elongated ovals in shape, pinched in a little

at the smaller end, and are greenish-white in colour, thickly speckled, spotted, streaked, and freckled with reddish and yellowish-brown. These markings usually form a more or less irregular cap at the larger end.

They average 0·72 inches in length by rather more than 0·55 in breadth.

480.—THE NORTHERN INDIAN ROBIN.

Thamnobia cambaiensis, Lath.

The Northern Indian Robin breeds in exactly the same way as the Indian Black Robin and about the same time.

The eggs, three in number, are moderately elongated ovals in shape and pointed at one end; they vary very much both in the ground colour and character of the markings, but the usual type is greenish-white closely freckled, or stippled with reddish-and yellowish-brown. Others are more or less boldly streaked and spotted with bright red-brown, with an occasional underlying spot of pale inky-purple. Creamy-, bluish-, and pale brownish-white varieties are not uncommon. One clutch I have is most beautiful, being of a pale sea-green colour, with a few large blotches of faint pinkish-purple and clayey-brown. Had I not shot the bird from the nest, I should have been at a loss to identify the eggs. They measure about 0·79 inches in length by about 0·59 in breadth.

481.—THE BLACK STONE-CHAT.

Pratincola caprata, Lin.

The Black Stone-Chat or White-winged Black Robin is a common permanent resident throughout the district; it however almost disappears from some parts during the breeding season, which extends from April to June.

They build flat saucer-shaped nests, composed of grass, fine roots, vegetable fibres, &c. It is, as a rule, placed in a hole in a bank, or well; occasionally, however, they build in bushes, but even here the nest actually touches the ground. I once found a nest in a small heap of rotten grass.

They are much more common on the hills than on the plains, more especially during the breeding season.

The eggs, four in number, often five, are moderately broad ovals in shape and pointed at one end; the ground colour is pale bluish-green, freckled, speckled and streaked with brownish-red. The markings are much more dense at the larger end, where they often form a confluent cap. They vary much in size, but the average is 0·67 inches in length by about 0·55 in breadth.

Khandalla, April to June.	*H. E. Barnes.*
Satara Ghats, April.	*J. Davidson, C.S.*
Nassick Ghats, March to May.	,,
Kanara, May.	,,
Eastern Narra, Sind, April to August.	*S. B. Doig.*

489.—THE PIED STONE-CHAT.

Saxicola picata, Blyth.

At present the Pied Stone-Chat can only be said to be a cold weather visitant; common in Sind and the north generally, becoming more and more scarce in the central portion of the Presidency, and being altogether absent from the south.

I found it to be a common breeder at Chaman, on the Khoja Amran range of hills in Southern Afghanistan; I have reason to believe that it breeds also in the Bolan Pass, and would not be surprised to learn that eggs had been taken in Northern Sind.

They breed in holes in trees in March, making a pad-shaped nest of grass, composed of dry grass and roots, lined with hair and feathers.

The eggs, four in number, are elongated ovals in shape, pinched in a little at one end; the ground colour is a delicate greenish-blue, obsoletely speckled with rusty-brown or pale brownish-red at the larger end, where the markings form an irregular zone. A few specks of the same colour are scattered over the rest of the surface of the egg. The average of twelve eggs measured is 0·81 inches in length by 0·56 in breadth.

Chaman, South Afghanistan, March. *H. E. Barnes.*

492*ter*.—THE GREY-BACKED WARBLER.

Ædon familiaris, Mene.

This is a very uncommon species, and only occurs as an exceptionally rare winter visitor to Sind and Northern Guzerat; further west,

in Beloochistan and Persia, it becomes more common, breeding freely at Bushire.

Mr. J. W. N. Cumming, to whose kindness I am indebted for a clutch of eggs of this species, has most obligingly furnished me with the following note, which is at present the extent of our information regarding the breeding of this somewhat rare bird:—

"Once only have I come across the nest of the Grey-backed Warbler, and that on the 14th April 1884, in the telegraph garden at Bushire. It was placed inside (a few inches from the top) of one of a number of old hollow telegraph posts, standing about three feet out of the ground, and forming supports to the wire fencing surrounding the garden. The eggs, four in number, were entirely covered with minute yellowish-brown spots and very pale purple blotches, hiding almost completely the white shell, and are similar in shape to, though a good deal larger than, those of *Thamnobia cambaiensis*.

"The nest was cup-shaped, and the materials consisted of fine grass, well lined with hair and fibres. In the evening of the same day, the female was caught seated in the nest, about to lay its fifth and last egg, for, on dissecting the ovary, after the removal of the skin, I found an entire and perfect egg, which would in all probability have been laid that night.

"My brother, also, when at Fao, came across a number of nests of this species, chiefly in holes in walls and on date trees, in the hollows at the bases of the leaves."

The eggs are very similar in shape and colour to the thickly speckled type of egg so commonly met with amongst those of *Thamnobia cambaiensis et fulicata*, but are rather larger, those in my collection measuring 0·82 inches in length by rather more than 0·62 in breadth.

Strictly speaking, an account of the nesting of this bird ought not to appear in this paper, as it has never been found breeding in this Presidency, but I have been assured that since the present arrangements for the supply of water at Karachi, this and several other rare birds have become more common, and it is not unlikely that sooner or later a nest will be found.

494.—THE BROWN ROCK-CHAT.

Cercomela fusca, Blyth.

The Brown Rock-Chat is very common at Mount Aboo, and in the vicinity of Neemuch, Rajpootana.

It does not occur in Sind, and is absent from the south. Mr. Davidson did not meet with it in Khandesh or in Nassick.

It is a permanent resident where found, breeding twice a year, during March and April, and again in June and July.

It is a bold and familiar bird, and is the Shama* of Mr. Phillips, (*Nests and Eggs of Indian Birds*); they frequent old buildings, forts, outhouses, and such like places, in holes and crevices in the walls of which they build their nests.

The bird has a peculiar habit of heaping up a pile of small stones, pebbles and broken tiles, leaving a depression in which it places its nest. I had the curiosity to weigh one of these heaps, which was composed entirely of broken tiles, and found it to weigh 7 lbs. 2 oz.; this was, however, much larger than usual. The nest itself is a thick, saucer-shaped pad, composed of fine grass, lined with wool and hair. The eggs, three in number, occasionally four, are moderately broad ovals in shape, pointed at one end, and are pale blue in colour, faintly speckled with pale reddish-brown. Sometimes the markings are bolder and brighter, and form a well-defined ring round the larger end. They measure 0·82 inches in length by about 0·62 in breadth.

Mount Aboo,	*March to April and*	*June to July.*			*H. E. Barnes.*	
Neemuch,	,,	,,	,,	,,	,,	,,
Saugor,	,,	,,	,,	,,	,,	,,

515.—THE LARGE REED WARBLER.

Acrocephalus stentorius, Hemp and Ehr.

Mr. Doig appears to be the only oologist who has succeeded in obtaining eggs of the Large Reed Warbler within our limits or even in India, although the bird breeds abundantly in Cashmere. He says (*Stray Feathers*, Vol. ix., p. 279):—"On the 4th August, while my man was poling along in a canoe, in a large swamp, on the look out for eggs, he passed a small bunch of reeds, and in them spotted a nest with a bird on it.

"The nest contained three beautiful fresh eggs. A few days later I joined him, and on asking about these eggs, he described the bird, and said he had found several other nests of the same species, but all

* The native name of this bird throughout the Central Provinces is "*Shama*"; the real Shama, *Cercotrichas macrura*, does not occur there.—H. E. B.

of them contained young ones, nearly fledged. I made him show me some of these nests, all of which were situated in clumps of reeds in the middle of the swamp, and in these same reeds I found and shot the young one, which though fledged was unable to fly. This I sent with one of the eggs to Mr. Hume, who has identified them as belonging to this species.

"The nests were composed of frayed pieces of reed-grass and fine sedge, the latter being principally towards the inside, thus forming a kind of lining. The nests were loosely put together and were about three inches inner diameter, one and a quarter inches deep, the outer diameter being six inches; they were situated about a foot over the water, in the tops of reeds growing in the water."

Mr. Hume, in *Nests and Eggs of Indian Birds*, page 327, writing of eggs received from Cashmere, described them as follows:—"The eggs of this species, as might have been expected, greatly resemble those of *A. turdoides*. In shape they are moderately elongated ovals, in some cases almost absolutely perfect, but generally slightly compressed towards one end. The shell, though fine, is entirely devoid of gloss.

"The ground colour varies much, but the two commonest types are pale green or greenish-white, and a pale, somewhat creamy, stone colour. Occasionally the ground colour has a bluish tinge.

"The markings vary even more than the ground colour. In one type the ground is everywhere minutely, but not densely, stippled with minute specks, too minute for one to be able to say of what colour; over this are pretty thickly scattered fairly bold and well marked spots and blotches of greyish-black, inky-purple, olive-brown, and reddish-umber-brown; here and there pale inky clouds underlay the most distinct markings.

"In other eggs the stippling is altogether wanting, and the markings are smaller and less well defined.

"In some eggs, one or more of the colours predominate greatly, and in some several are almost entirely wanting.

"In most eggs the markings are densest towards the large end, where they sometimes form more or less of a mottled, irregular, ill-defined cup.

"In length the eggs vary from 0·8 to 0·97, and in breadth from

0·58 to 0·63; but the average of the only nine eggs I measured was 0·89 nearly, by rather more than 0·61."

Eastern Narra, Sind, August, *S. B. Doig.*

530.—THE INDIAN TAILOR BIRD.

Sutoria sutoria, Forst.

The Tailor Bird is a common permanent resident throughout Western India, except in Ratnagiri, where it is stated by Mr. Vidal to be only sparingly distributed.

They breed from June to the end of August. To one unacquainted with their habits, their nests are hard to find, although during the time the hen is sitting on the eggs, the cock (who may be distinguished by his elongated central tail feathers), keeps up an incessant but pleasant twittering, on a neighbouring bough, and though one knows that a nest is somewhere close at hand, it requires a careful and persevering search to find it.

If the bird chooses a leaf sufficiently large, it sews the opposite edges together with cotton fibre or even spider's web, and in the cavity thus formed, it makes a soft nest of cotton, with just a few hairs to keep it in shape.

When two or more leaves are incorporated in the nest, it is not so neatly made, and is much easier to find.

They lay three or four eggs (twice I have found five eggs, and once seven), of an elongated oval shape, pointed at one end: they average 0·64 inches in length by rather more than 0·45 inches in breadth. They are of two types, in one the ground colour is white, suffused with a reddish tinge when the eggs are fresh and unblown, more or less spotted, speckled and blotched with reddish brown; in the other the ground colour is pale greenish, also spotted and speckled with brownish-red. The markings in both types are generally more numerous at the larger end, where they often form an imperfect zone; usually the markings are bright and boldly defined, but occasionally they are dingy.

532.—THE YELLOW-BELLIED WREN WARBLER.

Prinia flaviventris, Deless.

Within our limits the Yellow-bellied Warbler has only been recorded from Sind, where it is a permanent resident, breeding

apparently three times a year, *viz.* March, June and September. I have never seen a nest, but they are well described by Mr. Hume in his "*Nests and Eggs of Indian Birds.*" He says:—"The nest is of an oval shape, very obtuse at both ends, measuring externally four inches in length and about two and three-quarters in diameter. The aperture, which is near the top of the nest, is oval, and measures about an inch by one and a half inches. The nest is fixed against the side of two or three leafy twigs, to which it is bound tightly in one or two places with grass and vegetable fibres, and two or three leafy lateral twigs are incorporated into the sides of the nest, so that when fresh it must have been entirely hidden by leaves.

"The nest was in an upright position, the major axis perpendicular to the horizon. It is a very thin, firm, close, basket-work of fine grass, flower stalks, and vegetable fibres, and has no lining, though the interior surface is more closely woven and of still finer materials than the outside. The cavity is nearly two and one half inches in diameter." This is a description of a nest presented to Mr. Hume by Mr. J. C. Parker, who took it from the swampy banks of the canals that intersect the salt water lake, Calcutta. The eggs, four in number, are broad regular ovals, of a nearly uniform mahogany-red, measuring 0·56 inches in length by 0·45 in breadth.

They are highly glossy.

A nest taken by Mr. Doig was lined with horse hair and fine grasses.

Eastern Narra, Sind. March, June and September. *S. B. Doig.*

534.—THE ASHY WREN WARBLER.

Prinia socialis, Sykes.

Typical specimens of the Ashy Wren Warblers (*Prinia socialis*) and Stewart's Wren Warbler (*Prinia stewarti*) differ only in size, and many birds may with equal justice be assigned to either species. I am personally of opinion that there is only one species. Captain (now Colonel) Butler in his *Birds of Guzerat*, identified all his birds as *socialis*; the Deccan birds are also considered to be *socialis*. Mr. Davidson considers the birds he found in Western Khandeish to be *stewarti* (these birds were sent to Mr. Hume, and he also identified them as *stewarti*); in Neemuch an intermediate type prevails.

They are permanent residents, breeding from the commencement to the end of the rains.

The nests differ greatly, some of them are placed between two or more leaves, sewn carefully together, tailor-bird like, but as a rule not so neatly, a good deal of fine grass being used in addition to the cotton. Occasionally the nest is placed in a tuft of grass, and is then composed of tightly woven grass, and is dome-shaped, having the aperture near the top. Others are composed of vegetable down affixed to leafy twigs, much in the same way as those of the Yellow-bellied Wren Warbler (*Prinia flaviventris*).

The eggs, four or five in number, are oval in shape, and are of a brilliantly glossy-brick or mahogany-red colour, darker as a rule at one end, where it forms an indistinct cloudy cap.

They average about 0·64 inches in length by 0·47 in breadth.

535.—STEWART'S WREN WARBLER.

Prinia stewarti, Blyth.

The eggs of Stewart's Wren Warbler average 0·62 inches in length by about 0·46 in breadth, or rather smaller than those of the Ashy Wren Warbler; in all other respects they are identical.

538.—THE MALABAR WREN WARBLER.

Prinia hodgsoni, Blyth.

It is now admitted by most ornithologists, that the Malabar and Franklin's Wren Warblers (*Prinia gracilis*) are one and the same species, *hodgsoni* being nothing more than *gracilis* in breeding plumage.

The Malabar Wren Warbler is more or less common in suitable places in Western India, with the exception of Sind and perhaps Cutch, where it is not known to occur.

Mr. Davidson, who has had excellent opportunities of observing this bird, says *in epis*: "As far as I know I have never seen this bird in Sholapur, Satara, Poona or Kanara, while it is common in Khandeish and found in Nassick; I therefore suspect it is a Northern form in the peninsula."

They are permanent residents, breeding during the rainy season, making a somewhat similar nest to that of the Tailor Bird, but much smaller it is composed of very fine grass, placed between two

or more leaves, carefully sewn together, with cobwebs, cotton, or wool, and is almost completely hidden by leaves.

The eggs, four in number, are of an oval shape, and are of four distinct types, *viz.*:—

a. Pure unspotted glossy white.
b. White, speckled and freckled with reddish-brown.
c. Pale unspotted greenish-blue.
d. Pale blue, spotted and freckled with reddish-brown.

All the eggs in one nest are of one type. Some of the spotted eggs have the markings thickest at one end, where they often form an imperfect cap or zone.

They measure 0·57 inches in length by about 0·42 in breadth.

Baroda, July to September. — *H. Littledale, B.A.*
Western Khandeish, July to October. — *J Davidson, C.S.*

539.—THE RUFOUS GRASS WARBLER.

Cisticola cursitans, Frankl.

With the exception of the higher ranges of hills where it is scarce, and in the desert tracks where it is altogether absent, the Rufous Grass Warbler is a more or less common permanent resident, breeding during the rains, making a long purse-like nest, composed of silky, white, vegetable down, which is placed in the centre of a clump of grass, at a short distance only above the ground.

The blades of grass around the nest are so firmly interwoven with it, that it cannot be removed intact. It is rather larger at the bottom than at the top, and the tacking together of the blades of grass is continued higher on one side than the other, a small entrance being left on the opposite side, between the untacked stems; the inside is well lined or felted with soft vegetable down.

The eggs, four or five in number, are broadish ovals in shape, narrowing somewhat at one end; they average 0·58 inches in length by 0·46 in breadth.

In colour they are white, or faint greenish-white suffused with a pinkish tint when fresh and unblown, and are thickly speckled with pale reddish-brown. These specks are much more numerous at the

larger end, where they often form an imperfect zone or irregular cap.

Hyderabad, Sind,	*July.*	*H. E. Barnes.*
Deesa,	*July to September.*	*Do.*
Khandeish,	*September.*	*J. Davidson, C.S.*
Baroda,	*June to August.*	*H. Littledale, B.A.*

543.—THE COMMON WREN WARBLER.

Drymœca inornata, Sykes.

The Warblers belonging to the *Drymœca* group, seem to be very much mixed, the different species being very hard to discriminate. Personally I have only met two in the flesh that I could feel sure about; these are the present species and *Drymœca sylvatica*.

I strongly suspect that specimens of this last often do duty for *rufescens* and *insignis*.

The Common or Earth-brown Wren Warbler is a permanent resident throughout Western India, breeding from the middle of July to the end of September.

It usually constructs a rather pretty nest, composed of fine strips torn from blades of green grass, which are plaited together like those of the Baya, but the strips are finer and the nest is altogether neater. It is usually fastened to the thorny twigs of acacia bushes, at no great height from the ground, and the shape depends largely on the position of these twigs.

According to my experience, the nests are never lined, but Mr. Davidson writes that he has taken nests lined with fine fluff, with similar eggs, apparently belonging to this bird, but he has never actually shot the parents.

Another type of nest is composed of similar material, but is much coarser and is more loosely woven.

Nests of this latter description are built in clumps of sarpat, guinea, or other coarse-growing grass, or even in standing corn; they are purse-shaped with the aperture on one side, the opposite side being prolonged and projecting over so as to form a canopy.

In some cases the nests are sewn by shreds of fine grass, to the under side of a large leaf of the shrub that grows so commonly in grass jungle; this leaf forms a canopy over it, and effectually protects

it from rain; the nest, which is bag-shaped, is held in position by long stays of fine grass or fibres sewn and fastened to the nearest leaves and stalks.

The eggs, four or five in number (usually five), are moderately long ovals in shape, and are of a glossy pale greenish-blue colour, boldly spotted and blotched with chocolate and reddish-brown, and having a delicate tracery of interlaced hair-like lines at the larger end, but occasionally these lines are absent; the small end is comparatively unspotted.

The ground colour is subject to variation, eggs having been taken of a dull olive tint, and still more rarely of a clear reddish-white.

They average 0·61 inches in length by about 0·45 in breadth.

544 *bis.*—THE GREAT RUFOUS WREN WARBLER.

Drymœca rufuscens, Hume.

Captain (now Colonel) Butler, in his *Birds of the Deccan and South Mahratta Country*, says that the Great Rufous Wren Warbler is probably a permanent resident: it is also not uncommon in Northern Guzerat and on Mount Aboo. I cannot find any record of a nest having been taken in Western India, but Mr. Hume in *Nests and Eggs of Indian Birds* describes the nests as being a somewhat shallow, flimsy, watch-pocket, loosely put together, composed of coarse grass, and having a good deal of wool mixed with it; it is lined with fine grass.

Captain Cock, who took the eggs at Seetapore, says they breed in August, and that the eggs are facsimiles of those of *Pratincola ferrea*, *i.e.*, of a pale greenish-blue colour, minutely speckled with rufous, principally at the larger end. The size is not given.

Mr. Davidson asks, "Is this a good species?" as birds which he at first considered to be this, and which he sent to Mr. Hume, were identified by Mr. Sharp as specimens of *Drymœca sylvatica* in seasonal plumage.

545.—THE JUNGLE WREN WARBLER.

Drymœca sylvatica, Jerd.

The Jungle Wren Warbler occurs in Central India and Khandeish; it has not been recorded from the Deccan, Guzerat or from Sind.

I found it breeding near Neemuch in July ; the nest was purse-shaped, composed of rough grass, and contained three fresh eggs, pale greenish-white in colour, thickly freckled with rusty-red ; the specks were much more numerous at the larger end. Another nest taken at the same place, early in August, contained five eggs, similar in size and shape, but having the ground colour very pale greenish-white.

Mr. Davidson found them to be far from uncommon in Western Khandeish, and he informs me that the number of eggs is usually four, occasionally five ; he remarks that the eggs vary much, from pale bluish-white unspotted, to pinkish and bluish-white much marked with rusty-red.

They measure 0·69 inches in length by about 0·49 in breadth.

Neemuch, July to August. *H. E. Barnes.*
Saugor, July to September. *Do.*
Western Khandeish, July to September. *J. Davidson, C.S.*

545*bis*.—THE GREAT WREN WARBLER.

Drymœca insignis.

Mr. Littledale found many nests, which he considered as belonging to this species ; he describes the nests as domed, composed of fine grass, interwoven with growing grass. I have never met with the bird.

Baroda, July to September. *H. E. Barnes.*

550.—THE STREAKED WREN WARBLER.

Burnesia gracilis, Rüpp.

The Streaked Wren Warbler is a common permanent resident in Sind, frequenting the dense tamarisk thickets that occur so commonly on the dhunds. It is somewhat rare in Guzerat, and does not occur at all in the Deccan.

It breeds from May to September ; the nest is built in a low dense tamarisk bush, and is of an oval shape, with the entrance hole at one side near the top, and is composed of small dry tamarisk twigs and fine grass, well lined with soft vegetable down. The eggs, three in number, are greenish-white in colour, profusely streaked, speckled and spotted with bright brownish-red. The markings are usually more numerous at the larger end, where they not unfrequently form an imper-

fect zone or cap. In shape they are broad ovals, pointed at one end, measuring 0·55 inches in length by about 0·42 in breadth.

Hydrabad, Sind, June to August. *H. E. Barnes.*

550*bis*.—THE STREAKED SCRUB WARBLER.

Scotocerca inquieta, Rüpp.

The Streaked Scrub Warbler has been procured on the hills that divide Sind from Khelat, where it is most probably a permanent resident: it has not been recorded from any other part of Western India.

They breed freely on the plain between Chaman and Gatai, in Southern Afghanistan, and also in the Pishin Valley, and I have seen the birds during the breeding season in the Bolan Pass.

The nest is globular in shape, not unlike that of the Rufous-fronted Wren Warbler (*Franklinia buchanani*), but is somewhat larger; it is usually built in a stunted bush not more than two feet from the ground; it is well lined with feathers and fine grass, the outer portion consisting of coarse grass and fibres.

The maximum number of eggs is six, but four incubated ones are often met with; they are oval in shape, white, with a pinkish tinge when fresh, very minutely spotted and freckled with bright red. These spots are usually more dense at the larger end, but frequently they are evenly speckled over the whole surface.

They average 0·64 inches in length by 0·49 in breadth.

Chaman, South Afghanistan, March to April. *H. S. Barnes.*
Pishin Valley, ,, *March.* ,,

551.—THE RUFOUS-FRONTED WREN WARBLER.

Franklinia buchanani, Bly.

The Rufous-fronted Wren Warbler is common in Sind, and is most abundant in Guzerat and Rajpootana, and Mr. Davidson found it to be very common in Western Khandeish, but with the exception of Ahmednugger (from whence it has been recorded by Mr. Fairbank) it appears to be absent from the southern portion of the Presidency.

It is a permanent resident where found, breeding during the monsoons. The nest is a loose, ragged structure, of an irregular

purse-like shape, ccasionally almost globular, with the aperture near the top, rarely cup-shaped. It is composed of fine grass, and is lined with soft vegetable down. It is generally placed in a low thorny bush, not more than a foot or so from the ground.

The eggs, four or five in number, as often one as the other, are of a slightly elongated oval shape, and are white in colour, thickly spotted and speckled with dingy or purplish-red. In most eggs the markings are densest at the larger end, where they not infrequently form an irregular zone or cap.

In length they measure about 0·62 inches by nearly 0·48 in breadth.

Deesa, June and July.	*H. E. Barnes.*
Hydrabad, July and August.	,,
Neemuch, July to September.	,,
Dhulia, Khandeish, June to October.	*J. Davidson, C.S.*

553.—SYKES' TREE WARBLER.

Hypolais rama, Sykes.

Sykes' Tree Warbler occurs more or less commonly throughout Western India, in most places only as a cold-weather visitor, but in Sind it is a permanent resident.

Mr. Doig found them breeding most abundantly from March to July. He says (*Stray Feathers*, Vol. IX., p. 280):—

"Locally they are very numerous, as I collected upwards of 90 or 100 eggs in one field, about 8 acres in size. They build in stunted tamarisk bushes, or rather in bushes of this kind, which were originally cut down to admit of cultivation being carried on and which afterwards had again sprouted. These bushes are very dense, and in their centre is situated the nest, composed of sedge, with a little soft grass reed. The eggs are as a rule four in number, and are of a dull white ground, with brown spots, the large end having as a rule a ring round it of most delicate, fine, hair-like brown lines, something similar to the tracing to be seen on eggs of the Common Wren Warbler (*Drymœca inornata*)."

I found a nest containing young ones just hatched, and a few fragments of shells, which I carefully preserved, in a small bush at the foot of the Khojak, near Chaman, South Afghanistan. I did not see the bird, and it was not until I received a clutch of eggs from Mr. Doig, that I was able to fix the identity.

I have also received eggs taken by a friend close to Karachi.

The eggs are broad oval in shape, averaging 0·615 inches in length by 0·495 in breadth.

Eastern Narra, Sind, March to July. *S. B. Doig.*
Chaman, South Afghanistan. May. *H. E. Barnes.*

583*bis*.—THE DESERT WARBLER.

Sylvia nana. Hemp. and Ehr.

This bird occurs in the Sind deserts and also in the Runn of Cutch.

Mr. Doig found young birds just able to fly at the latter place.

This is all I can find on record regarding this bird, which personally I have never met with.

Runn of Cutch, 13th Nov. (young only). *S. B. Doig.*

589.—THE PIED WAGTAIL.

Motacilla maderaspatensis, Gm.

The Pied Wagtail is very generally distributed throughout the Presidency; it is a permanent resident, breeding nearly the whole year through.

They have several broods during the season.

One pair, that frequented a small tank adjoining my compound at Poona, had a nest with two young ones and an addled egg on the 3rd March; on the 23rd April I took three incubated eggs from the same nest; they made another nest about a yard away from the first one, which contained two eggs on the 9th May. In July I noticed them feeding a pair of young birds, and towards the end of August, they were making preparations for another brood; so that this pair had at least five clutches of eggs in one year. They were the only Wagtails on the tank and were very pugnacious, and would allow no other bird to remain on the tank; their own young ones, as soon as they were able to forage for themselves, were even driven away.

The nest, which is a mere pad, composed of grass, sedges, fibres, &c., is always near water, and is built upon something solid, such as the ledge of a rock, a niche in a stone bridge or wall, a hole in a bank or well, or any such similar place.

The eggs, three or four in number, vary much both in size and shape, but are always more or less pointed at one end. The general

colour is greenish or earthy-white, spotted, speckled, streaked, clouded or smudged with olive-, purplish-, or earthy-brown.

They average 0·9 inches in length by about 0·65 in breadth.

600.—THE INDIAN TITLARK.

Corydalla rufula, Vieill.

The Indian Titlark appears to be a common permanent resident throughout Western India, breeding from about the middle of March to the commencement of June. I think they have at least two broods during the season. The nest, composed of grass roots and stems, is usually placed in the centre of a clump of coarse grass (resting on the ground), occasionally under the shelter afforded by a clod of earth. The nest is practically cup-shaped, but many, especially when in the first named situation, have a small quantity of grass sprinkled lightly over the nest, as if by accident, which effectually hides it from all those who are not in possession of the secret.

The eggs, from two to four in number, are oval in shape and dingy brownish-white in colour, profusely speckled and spotted with brownish-red and umber-brown, more densely so at the larger end. The eggs are liable to variation both in size and colour, but the average is about 0·8 inches in length by about 0·6 in breadth.

THE BUTTERFLIES OF THE CENTRAL PROVINCES.

By J. A. B.

The Central Provinces, consisting of nineteen districts, are situated almost in the centre of the Indian Peninsula. Roughly speaking, they are bounded on the east by the Bengal Presidency, on the north by the North-West Provinces and Central Indian Native States; on the west by the Bombay Presidency; and on the south by Berar, the Nizam's Territory and the Madras Presidency.* Most of the country which borders these provinces,

* Their length is, from east to west, about 600 miles, and their breadth from north to south, about 500 miles. Their area is about 113,000 square miles, of which 84,200 are English, and 28,800 Feudatory territory.

however, does not belong to the British Government, and, as a fact, only 160 miles of the borders march with English territory, out of a total of 2,700 miles. They are thus almost entirely isolated from other purely British provinces. They are geographically divided into two parts by the Satpura range of mountains. Commencing in the east at the peak of Amarkantak, 3,500 high, these mountains stretch away till they meet the Western Ghats, gradually decreasing in height as they trend westwards, although many of the peaks and plateaux have a higher elevation than has Amarkantak. The highest peak is Dhupgarh, 4,500 feet, a thousand higher than the Pachmarhi plateau and sanitarium, which it overlooks. The hills go away in two ranges, between which there is a table land, and on which are situated the districts of Balaghat, Seoni, Chindwara, and Betul. The table land is broken up and diversified by numerous ranges and peaks, and valleys of various extent, height and depth, each range bearing a local name. The table-land closes in on the west, and the two main ranges run north and south of the Tapti River, joining the Rajpipla Hills in Khandesh, and another tract of hilly country, till the Western Ghats are reached. North of the Satpura Hills lies the plain of the Narbada Valley, and north of this again there is a plateau on which are situated the districts of Damoh and Saugor, the eastern scarp of which is bounded by the Bhanrer and Kaimur hills, both offshoots of the Vindhyan range. South of the Satpuras lie the plains of Nagpur and Chhattisgarh, and to the east of Chhattisgarh is the plain of Sambalpur. Chhattisgarh and Sambalpur are drained by the Mahanadi. South of the Nagpur plains flows the Godaveri. Both these rivers flow to the east and empty themselves into the Bay of Bengal, while the Tapti and Narbada flow to the west into the Arabian Sea. There are several other large rivers in the Provinces, all tributaries of the four great rivers already mentioned. To the north of the Chhattisgarh and Sambalpur plains there are ranges of hills, a continuation of the Satpnras, but of lower elevation, covered for the most part with dense jungle, and south of these two plains lie the forest-clad hills of Jeypore and Bastar, the latter country extending away to the Godavery, south of the Nagpur plain, where there is another large tract of forest country.

The Central Provinces, it will thus be seen, is generally a mountainous country, with plateaux, plains, hills and valleys breaking up and diversifying its surface, and giving to it a greater variety of scenery than, perhaps, is to be met with in any other part of India. It may not be so grand as in many other districts, but for variety and charm I think these Provinces hold their own against many more celebrated and better known.

The year is divided into three seasons—the cold season, the hot season, and the rainy sason, four months of each. On the plateaux the climate is usually cool, even during the hottest part of the year, and during the winter frost is not uncommon. In the plains the cold weather is the pleasantest time, but it is a pity that it does not last long enough. The rains are moderate, ranging from thirty to sixty inches in the various parts of the Provinces, the greater rainfall, of course, being where the forests are thickest, and the lesser where the open country predominates. The hot weather in the plateaux is not at all unpleasant, the nights being always cool; and even in the plains this is usually the case. During the day, however, the hot weather in the plains is burdensome, for a fierce wind, like the breath from a furnace, rages, and the thermometer shows a high register—one hundred degrees being about the average. To protect ourselves we have to resort to the grateful and fragrant *khas-khas tattie*, the gently swinging punka, and the softly murmuring thermantidote.

As we have three seasons, so there are three periods of the year when butterflies do most prevail—these times being at the change of the seasons in February, June, and October. The butterflies that have two seasonal broods only come out in June and October and the latter brood would appear to hybernate; for in February, when numerous other species appear in lovely freshness, the "seasonal brooded" butterflies appear, but none of these double-brooded butterflies have I seen in February that seem fresh and new. The best times for procuring these in their different forms is in June and October, and October is undoubtedly the best month in all the year for every variety of butterfly.

I have prepared a list of all the butterflies that have been collected by myself in the Central Provinces, together with a few

notes about them. From Mr. Lionel de Nicéville, the author of "The Butterflies of India, Burmah and Ceylon," I have received much help in compiling these notes. I had been a collector of butterflies and other Natural History "curiosities" off and on since I was a boy at school. The study of entomology, and particularly of Lepidoptera, was fostered in our young minds by the existence, in our midst, of a scientific master, who used to appropriate all our best specimens: but at the same time, be it said in justice to him, he always gave a prize for the best classified collection of butterflies and moths at the end of the midsummer term. When I came out to India, and saw the immense variety of Nature's works around me, I set about collecting those which could most easily be preserved. Birds, a specimen or so of each, I have skinned of every kind that I could come across; snakes, lizards, eggs, fossils, &c., I have collected, and last but not least (to my mind), butterflies and moths. But all in a desultory sort of way. I could never classify anything except perhaps the birds (thanks to dear old Jerdon) because I had no books to refer to. In the mofussil, where my lines have been chiefly cast, libraries are few and far between, while, where these do exist, works of reference on Natural History do not usually find in them a place. I made several collections of Butterflies, all gone to rack and ruin, alas! and was in despair of ever getting my specimens named till about eight years ago, when Mr. de Nicéville made an appeal for help to enable him to get together materials for the publication of his great work. I at once responded to his appeal, and the result has been that I have been able to name my specimens through his kindness. I used to send him all my specimens till 1883, when I had to go home on sick leave; but on coming out again in the following year I thought I might as well begin a classified collection for myself. It was not, however, till 1886 that I was able to take it up as thoroughly as I could wish. Much of the Central Provinces is not favorable for the collector; but the ground was then quite new, for, as far as I know, no one else had before me taken up this branch of Natural History in these parts with an eye to working it up. There is no doubt that the Satpura Hills, and the forests all over the Provinces, would, if properly worked, yield many rare species. There may still be some new to science,

and I think that almost as many other species as those I have obtained may eventually be found to exist. One species, a *Melanitis*, quite new to science, was discovered in 1886, and there is no reason why there should not be others in these remote hills and forests to delight the hearts of collectors. The collection and study of butterflies in this country is a most fascinating and delightful way of improving one's leisure hours. In the first place, their variety is so infinite, their colouring so exquisite and wonderful, and each day may reveal a prize. It is splendid exercise also and trains one's eyes to observe. There is nothing more pleasant than a walk in the jungle with a net, when there is no chance of getting any larger game, and consequently useless to take out a gun. Armed with a net one can get as much exercise as one wants, and with a killing bottle for other insects, the Naturalist returns to his tents with a hearty appetite for breakfast, and his pockets full of treasnres, to be put away, examined, and set up at some future time. The habits of many of our Indian butterflies are of much interest. Each has a different style. Old gardens, full of ancient orange, lime, custard-apple and mango tree, and overgrown with weeds and wild flowers, or else a glade at the head of a mountain ravine, are about as good places as there are to observe them. Come along to such a spot as the last indicated, and let us watch and study them. We have taken a long walk from the plateau, and having descended a winding path, by the side of which hurries along a little stream, rushing over pebbles and boulders, flinging itself over great black rocks in tiny sparkling cascades, foaming at one moment and the next gliding smoothly under huge old mango trees, covered with many an orchid and tree fern, we arrive at a small plain. The plain is backed, on the side where the stream now quietly murmurs along, by dark crags; on the other it goes away, till it meets the opposite hill slope. The plain is covered by rank herbage, most noticeable among it being the Khāns grass (*Saccharum spontaneum*), its graceful silken plumes rustling and nodding to the breeze which comes whispering through the trees on the margin of the plain. We have now come to the end of the plain, which closes in rather abruptly, and have to cross the stream which we observe is beautifully clear and limpid. Shoals of tiny

silvery fish dart away in terror at our approach, and scores of exquisitely coloured dragon-flies, their wings and bodies glittering like living gems, rise from the weeds and rushes at the edge of and in the water, and rustle away with quivering wings. The shores of the stream are sandy, and our way winds along it under the shade of graceful forest trees. Our favourite hunting ground is near. The stream turns at a sharp angle and plunges through dark rocks into chasms of unknown depth. At the entrance of the glen we are now exploring are some magnificent old mango trees, their roots entwined amongst the rocks, their boughs o'ershadowing the stream and the path along which we are wandering. The glen is full of small trees, growing between boulders, and is covered with various plants bearing flowers of sweet odour, and of every imaginable hue. Beyond the glen or glade the ground goes suddenly away to a ravine, running towards the direction of the setting sun, and as we approach the edge we are aware of a strong breeze coming fresh over the hills and up from the ravine, bringing from its depths the sound of falling waters far below and the sweet and mellow whistle of the Malabar Whistling Thrush (*Myiophonus horsfieldi*), or the "Schoolboy" as it is popularly called. Under the mango trees, at the entrance of the glen, where the air is still, are seen floating along those very common but most exquisitely graceful of all butterflies, the several kinds of *Danainæ, Danais limniace*, pale blue, veined with black; *D. chrysippus*, tawny red, relieved by pure white and black; *D. genutia* of the same colouring, with the addition of black veins; and *Euplœa core*, velvety black embroidered with white. They sail and float along in the most aërial yet lazy way, as much as to say, "Oh, yes! we know we are handsome, but it's no matter, for no one will touch us." They settle in scores on the plants around without an attempt at concealment; they seem to know that nothing will dare touch them, they are so tough, so leathery and by no means savoury morsels to judge from the unpleasant odour they all exhale—a protection afforded them by Nature to keep off the attacks of all enemies of the Butterfly tribe, except those of the human race, alack! This natural protection seems to have been taken advantage of by other butterflies, who mimic the shape and color of the commoner kinds; but of this more in its proper place. Each step we

now take through the trees disturbs scores of *Nymphalidæ*. The *Satyrinæ* are represented by various kinds of *Lethe*, *Melanitis*, *Mycalesis* and *Ypthima*, while nearly all the *Junoniæ*, various kinds of *Neptis*, *Athyma*, *Symphœdra* and *Precis iphita* represent the *Nymphalinæ*. "Skippers," too, glance away from many a leaf, and "blues" and "coppers" twinkle away into the grass and up into the trees. *Absara suffusa*, "that embodiment of *vanity*" (see Mr. Aitken in our Society's Journal,*) jostles and challenges every other butterfly that passes by. Among the dead leaves it is hard to distinguish *Precis iphita*, the *Melanites*, *Mycaleses* and *Ypthimæ*. As we go deeper into the shade, close up to the rocks, and come back towards the stream, sudden flashes of blue and gold reveal to our wondering eyes the existence of *Kallima inachis*, the great "leaf butterfly." As sudden as was its appearance, so is its disappearance, and we cannot for the life of us make out what has become of it. Surely we saw it settle under that bit of overhanging rock, or was it on the trunk of that tree that is close to the path? Where is the nymph that so suddenly disclosed herself and as suddenly vanished. Look closely and examine every square inch of rock and tree-trunk surface. Here's an old and withered leaf—can she be enclosed within it? Try! The net is dropped over the *leaf*, and up rises our wild and wayward nymph, captive and struggling, as beautiful a creation as was ever made in Nature's wonderful workshop. As we go on the sprightly *Symphœdra nais*, with various species of the genus *Junonia*, equally as sprightly, rise rapidly from almost beneath our feet, and skim along to other spots several yards ahead, where they settle again with fanning wings. The *Neptes* and *Athyma perius*—so hard to distinguish the one from the other when on the wing, their general colouring and manner of flight so closely resembling one another—rise with a graceful spring and float along on expanded wing, settling again on the upper surface of the leaves not very far ahead. They literally *float* along, for they expand their wings and seem scarce to flutter them, so that, when on a level with the eye, they disappear and re-appear in quite a wonderful way. Many species of *Ypthima* flutter feebly out of the grass and dance away along the path and in and out the stems

* Vol. I., page 215 (*A. fraterna* and *A. suffusa*, perhaps, are the same butterfly).

of grass. The *Catopsiliæ* come with a series of vigorous, bounding sweeps and curves; they all look as if they were hurrying to catch the last train, but were undecided which course to steer. A few "swallow-tails" are seen majestically sailing along, *P. polymnestor* flashing out in its livery of black and azure, while *P. nomius*, with delicate pale green wings, "zebra-marked," flutters in and out the bushes. Wherever the ground is slightly moist they most do seem to congregate, and on some chosen spots, apparently not different to many close by, they cluster literally in scores, one might say hundreds, presenting a most lovely and animated appearance, as they eagerly suck up the moisture through their trunks. Among them we may see a *Charaxes* or two—these are grand creatures in their manner of flight, such power, such ease, such swiftness! Disturbed, they are off like lightning, and disappear from sight like spirits; but one has only to wait, and back they come to the same spot, so that by a stealthy approach and one swift movement of the net they are captured.

Down in the khuds and in the deepest shade we come across the *Kallima* and *Melanitis* again, as well as various kinds of *Hesperidæ*, that are crepuscular in their habits.

A *Melanitis*, when disturbed during the day, acts for all the world just as an owl does, and hurries along as if it could not see properly, in irregular waves of flight, knocking up against anything that happens to be in the way. But only wait till evening, just when the sun has set, for—

It is the hour, when from the boughs
The nightingale's high note is heard;
It is the hour when lovers' vows
Seem sweet in every whisper'd word—
And gentle winds and waters near,
Make music to the lonely ear.
Each flower the dews have lightly wet,
And in the sky the stars are met,
And on the wave is deeper blue,
And on the leaf a browner hue,
And in the heaven that clear obscure,
So softly dark, and darkly pure,
Which follows the decline of day,
As twilight melts beneath the moon away—

and then the *Melanites* come out and dance beneath the shade of lofty trees like so many elves. They flit about and have aerial duels, or perhaps the movement gone through may best be likened to that in the "Sir Roger de Coverley," when the couples come out and manœuvre singly and together. The other *Melanites* sit by on the lower bushes, and watch each couple or trio enjoying themselves. They are so engrossed in this amusement, that by gently walking into their midst one's presence does not disturb them, and they will come and settle on one's head, shoulders, and outstretched hands. I, too, as noted by Mr. Aitkin, have seen many of them go straight up into the sky and clean out of sight. I have noticed this in the early morning as well as in the evening. I suppose the reason is that they have so long been snugly lying hidden under the bushes that they love to get some of the freshness high up in the air. By searching closely and waving one's net gently over the surface of the rocks, the dusk-loving "skippers" are put up. Watch where they settle, and go gently up to the spot. Drop the net, extended by being held at the bottom, quietly over the place, and the "skipper" rushes out only to be captured.

The shades of evening are now falling, and we must hasten back to our camp, otherwise we might meet a panther or even a tiger just about to commence his nightly prowl. The jackals are already beginning to wake the echoes with their unearthly howls, and the ghastly chuckle of the horned owl comes from out the depths of those dark old trees. The Night-jar repeats monotonously his notes like the sound of a stone sent skipping along the ice, and the air is filled with the whirr and buzz of beetles and the chirp and tinkle, as of tiny bells, of innumerable crickets and grasshoppers. As we climb to the top of the ravine, and look back over it and away to the west, toward the setting sun, our eyes and hearts are gladdened by the sight of a lovely, soft, yet exquisitely beautiful and radiant glow like unto the colour of an amethyst—a glory which fills the air and floods hill and forest. Above in the sky the glow is red like rubies, fading away into carmine, and higher up, into the clear pale blue of an Indian evening sky. Below in the valleys the shades are purpling and deepening into the grey of night, and the mists are rising and strike cold and ghost-like. 'Tis a scene of enchantment from which

we must tear ourselves away—a glory which cannot be seen often and which will live in our memories for ever.

As we get up on the high level and catch sight of our tents, the lights from which shine cheerily out, it is already night and the glorious array of "stars come rushing out" from a deep still blue sky filling the air with a pale radiance which enables us to see our way quite plainly. It is as glorious a night as it has been a day, and we sit down with enjoyment to our dinners, after which a pipe and a mild whisky and soda send us happy and conteuted to bed.

The butterflies given in the accompanying list,* with very few exceptions (which will be noted), have all been actually taken by myself, so that I can vouch for their being strictly "butterflies of the Central Provinces." The few that I have not taken myself have been caught by natives who have collected for me.

To be continued.

A PRELIMINARY LIST OF THE BUTTERFLIES OF MYSORE.

By E. Y. Watson.

In October, 1888, an opportunity offering, I availed myself of it to send my native collector to catch butterflies in Mysore. The opportunity in question was, that the late Government Geologist of Madras, Mr. Bosworth Smith, was going on a prospecting tour from Kolar in the east to Kathlekan in the west of Mysore, at which latter place he proposed staying for about a couple of months. Collecting was carried on at all the halts *en route* between Kolar and Kathlekan, and Mr. Bosworth Smith carefully noted on each specimen the place of capture. Between Kolar and Banavar the jungle consisted of low scrub, and here, as might be expected, the prevailing genus was *Teracolus*; this genus almost entirely disappears after Kadur, where the jungle changes to forest more or less thick, and here the prevailing genera are *Melanitis* and *Mycalesis*. Of the former genus many very curious examples were obtained, some of which appear to belong to an undescribed genus. Although I directed my collector's attention particularly to *Yphthimas*, of which he obtained a very large number of specimens,

* The list will be published in the next part of this paper.

yet only the two generally distributed species *huebneri* and *philomela* were represented. The species most worthy of notice is *Arhopala bazalus*, of which a single specimen was obtained at the Gersoppa Falls, this species being hitherto only recorded from Assam and Sikkim. With the exception of the *Hesperiidæ*, of which very few species were obtained, the collection will be found to be fairly representative; though without doubt, if collecting could have been carried out during the rains, numerous species would have been added—the months October to February, during which the collection was made, practically representing the dry season. I had hopes of being able to collect personally in Mysore during the rainy season of 1889, but was not able to do so; and here I am in Burmah with no chance of visiting Mysore for some years to come, so I have thought it best to publish this list, incomplete as it is, in the hopes that some more fortunate person may be able to add to it hereafter, and will find it of some use to start from.

I have also included in this list a few species obtained by myself at Nelamangala and Soldevanhalli, two villages in the neighbourhood of Bangalore.

The following is a complete list of the places near which specimens were obtained, with their approximate height:—

	Kolar, Kolar District	2,552 ft.
	Bangalore, Bangalore District	3,000 ft.
	Nelamangala do. do.	3,000 ft.
	Soldevanhalli do. do.	3,000 ft.
	Nittur, Tumkur do. do.	2,700 ft.
	Kippenhally do. do.	2,734 ft.
	Arsikare, Hassan do.	2,666 ft.
	Banavar, Kadur do.	2,550 ft.
	Kadur do. do.	2,550 ft.
	Tarikare do. do.	2,235 ft.
	Lukvalli do. do.	2,200 ft.
*	Kathlekan do. do.	2,000 to 4,000 ft.
	Sagar, Shimoga District	1,970 ft.
	Gersoppa Falls, Shimoga District	1,670 ft.

* This is a Coffee estate, where the bulk of the collection was made.

NYMPHALIDÆ.

[NOTE.—The species marked thus* have been named by Mr. de Nicéville.]

* 1. Hestia lynceus, Drury (*malabarica*, Moore).
Kathlekan, November. Numerous specimens.

2. Danais limniace, Cramer, Bangalore, October; Tarikare, November; Sagar, Kathlekan, Nelamangala, January. Numerous specimens.

3. Danais chrysippus, Linnæus. Nelamangala, January. Common.

4. Danais genutia, Cramer, Nelamangala, January. Common. Tarikari, November. One male.

5. Danais aglea, Cramer (*grammica*, Boisduval).
Kathlekan, Lukvalli, November. Numerous specimens.

6. Euplœa core, Cramer. Bangalore, October; Kathlekan, Arsikare, Kadur, Banavar, Lukvalli, November; Sagar, Gersoppa Falls, January. Very numerous specimens.

7. Euplœa coreoides, Moore. Kadur, November; Kathlekan, November and January. A few specimens.

8. Mycalesis anaxias, Hewitson. Kathlekan, November. A single specimen.

9. Mycalesis mandata, Moore. Typical, Kathlekan, November. A few specimens. Transitional to Mandosa, Kathlekan, November and December. A few specimens.

10. Mycalesis mandosa, Butler. Kathlekan, November, December, and January. Very numerous specimens.

11. Mycalesis mineus, Linnæus. Kathlekan, November, December, January. Very common, but only the dry weather forms, *visala* and *indistans*, met with.

12. Mycalesis junonia, Butler. Lukvalli, November; Kathlekan, November, December, January. Very numerous.

13. Lethe todara, Moore. Kathlekan, November. Numerous specimens.

14. Lethe neilgheriiensis, Guérin. Kathlekan, Lukvalli, November. A few specimens.

15. Yphthima philomela, Johansen. Lukvalli, Kadur, November; Kathlekan, November, December, January. Very numerous specimens.

16. Yphthima huebneri, Kirby. Lukvalli, Tarikare, November; Kathlekan, November, December, January. Very numerous specimens; the great majority of this and the preceding being and *marshallii howra* respectively.

17. Melanitis leda, Linnæus. Typical: Kolar, October; Lukvalli, November. Two specimens. Transitional; Lukvalli, November; Kathlekan, December. Two specimens. *Ismene*; Lukvalli, November; Kathlekan November, December. Very numerous specimens.

*18. Melanitis bela, Moore. Kathlekan, November, December, January. Numerous specimens, presenting some very curious varieties.

*19. Melanitis gnophodes, Butler. Kathlekan, November, December. A few specimens. The underside of this species does not seem to vary very much, and is very similar to some varieties of *ismene*.

*20. Melanitis sp. Kathlekan, November, December. Four specimens; these may possibly be very aberrant forms of *M. bela*.

*21. Discophora lepida, Moore. Kathlekan, November. A single female.

22. Telchinia violæ, Fabricius. Kadur, November; Nelamangala, January. Common.

23. Ergolis ariadne, Linnæus. Kolar, October; Banavar, Lukvalli, Kathlekan, November. Common.

24. Byblia ilithyia, Drury. Kolar, October. A few specimens.

25. Cupha erymanthis, Drury. Gersoppa Falls, January. A few specimens.

26. Atella phalanta, Drury. Kolar, Bangalore, October; Tarikare, November; Nelamangala, January. Very common.

27. Cynthia saloma, Swinhoe. Gersoppa Falls, January. A single male.

28. Precisiphita, Cramer. Lukvalli, November; Kathlekan, November, December, January. Common.

29. Junonia almana, Linnæus. Tarikare, November; Kathlekan, Lukvalli, December. Common.
30. Junonia asterie, Linnæus. Kathlekan, November. A single worn specimen.
31. Junonia lemonias, Linnæus. Bangalore, October; Kadur, Arsikari, November; Nelamangala, January. Common.
32. Junonia hierta, Fabricius. Kolar, October; Tarikare, Kadur, November; Nelamangala, January. Common.
33. Junonia orithya, Linnæus. Kolar, October; Kadur, Banavar, November; Nelamangala, January. Common.
*34. Neptis hordonia, Stoll. Lukvalli, November; Kathlekan, November, December. A few specimens.
*35. Neptis viraja, Moore. Kathlekan, November. Two specimens.
*36. Neptis varmona, Moore. Lukvalli, November; Kathlekan. November, December, January. Numerous specimens.
*37. Neptis swinhoei, Butler. Kathlekan, December; Sagar, Gersoppa Falls, January. A few specimens.
*38. Neptis kallaura, Moore. Kathlekan, November. A single female.
*39. Neptis nandina, Moore. Kathlekan, November. A single female.
*40. Neptis ophiana, Moore. Kadur, November. A single male.
*41. Cirrhochroa relata, de Nicéville. Gersoppa Falls, January. A single male.
42. Hypolimnas bolina, Linnæus. Nittur, November; Gersoppa Falls, January. A few specimens.
43. Hypolimnas misippus, Linnæus. Kadur, Banavar, November; Gersoppa Falls, January. Numerous males.
44. Parthenos virens, Moore. Gersoppa Falls, January Two specimens.
45. Limenitis procris, Cramer. Kathlekan, November. A single specimen.
*46. Athyma mahesa, Moore. Gersoppa Falls, January. Three males.

*47. Athyma selenophora, Kolar. Gersoppa Falls, January. One male.

*48. Athyma inarina, Butler. Kathlekan, November. One male.

*49. Symphaedra nais, Forster. Kolar, October; Nelamangala, January. Common. Gersoppa Falls, January. A single specimen.

50. Euthalia evelina, Stoll. Gersoppa Falls, January. A single male.

51. Euthalia lepidea, Butler. Kathlekan, November, December; Gersoppa Falls, January. A few specimens.

52. Euthalia garuda, Moore. Gersoppa Falls, December. A few specimens.

53. Pyrameis cardui, Linnæus. Kadur, November. A single specimen.

54. Vanessa canace, Linnæus. Gersoppa Falls, January. A single worn specimen.

55. Cyrestis thyodamas, Boisduval. Kathlekan, November; Gersoppa Falls, January. Numerous specimens.

56. Charaxes athamas, Drury. Kathlekan, November. A single specimen.

57. Charaxes imna, Butler. Kathlekan, November. Two males.

LEMONIIDÆ.

58. Abisara suffusa, Moore. Kathlekan, November, December, January; Gersoppa Falls, January. Numerous specimens.

LYCÆNIDÆ.

*59. Curetis bulis Doubleday, Hewitson. Kathlekan, November, December, January. Two males, one female.

60. Curetis thetys, Drury. Kathlekan, November, December, January; Gersoppa Falls, January. Two males three females.

61. Cyaniris albidisca, Moore. Kathlekan, November; Gersoppa Falls, January. A few males.

62. Cyaniris limbatus, Moore. Lukvalli, November; Gersoppa Falls, January. Numerous specimens.

63. Cyanirls akasa, Horsfield. Kathlekan, November. A single specimen.

64. Chilades putli, Kolar. Nelamangala, January. One specimen.

65. Zizera pygmæa, Snellin. Kolar, October. One specimen.

66. Zizera ossa, Swinhoe. Kolar, October; Arsikari, Kathlekan, November; Nelamangala, January. A few specimens.

*67. Azanus gamra, Lederer. Kolar, October. A few specimens.

68. Tarucus plinius, Fabricius. Kolar, October; Kippenhally, Banavar, November. A few specimens.

69. Castalius rosimon, Fabricius. Kolar, October; Kathlekan, Arsikari, Lukvalli, November. Common.

70. Castalius ethion, Doubleday, Hewitson. Arsikari, November. A single male.

71. Castalius interruptus, Moore. Kathlekan, November. One specimen.

72. Everes parrhasius, Fabricius. Lukvalli, November; Kathlekan, November, December, January. Numerous specimens.

73. Jamides bochus, Cramer. Tarikari, Arsikari, November. Two males.

*74. Lycaenesthes lycænina, Felder. Kathlekan, November. One specimen.

*75. Nacaduba dana, de Nicéville. Kadur, Kathlekan, November. Numerous specimens.

76. Nacaduba hampsoni, de Nicéville. Kathlekan, November. A few specimens.

77. Calochrysops strabo, Fabricius. Kadur, Arsikari, November; Kathlekan, Sagar, January. Numerous specimens.

78. Calochrysops cnejus, Fabricius. Kolar, October; Tarikari, Arsikari, Kathlekan, Lukvalli, November; Gersoppa Falls, January. Numerous specimens.

79. Polyommatus boeticus, Linnæus. Arsikari, Kathlekan, November; Sagar, Nelamangala, January. A few specimens.

80. Lampides ælianus, Fabricius. Kolar, Bangalore, October; Kathlekan, December; Lukvalli, Arsikari, Kippenhally, November. Numerous specimens. Var. *alexis*, Kolar, Bangalore, October; Arsikari, November; Gersoppa Falls, January. A few specimens.

81. Lampides elpis, Godart. Kathlekan, November; Gersoppa Falls, January. A few specimens.

82. Talicada nyseus, Guériu. Kolar, October; Kathlekan, November; Sagar, Nelamangala, January. A few specimens.

83. Virachola isocrates, Fabricius. Kolar, October. A single female.

*84. Aphnæus elima, Moore. Kolar, Bangalore, October. A few specimens.

*85. Aphnæus vulcanus, Fabricius. Kolar, October; Soldevanhalli, January. Two specimens.

*86. Aphnæus lilacinus, Moore. Bangalore, October. A single specimen.

*87. Aphnæus sp. Kathlekan, November. A single specimen.

*88. Bindhara sugriva, Horsfield. Gersoppa Falls, January. Two males, one female.

*89. Arhopala canaraica, Moore. Gersoppa Falls, January. A few specimens.

*90. Arhopala bazalus, Hewitson. Gersoppa Falls, January. A single specimen.

91. Arhopala amantes, Hewitson. Gersoppa Falls, Sagar, January. Numerous specimens.

92. Arhopala centaurus Fabricius. Gersoppa Falls, Sagar, January. A few specimens.

PAPILIONIDÆ.—PIERINÆ.

93. Nychitona xiphia, Fabricius. Lukvalli, Tarikare, Nittur, November. A few specimens.

94. Terias hecabe, Linnæus. Kolar, Bangalore, October; Kadur, Nittur, Banavar, Kippenhally, November. Numerous specimens. Form *excavata*, Moore. Kolar, Bangalore, October. A few specimens.

95. Terias purreea, Butler. Kolar, Bangalore, October. A few specimens.

96. Terias drona, Horsfield. Kolar, October; Tarikari, November; Soldevanhalli, January. A few specimens.

97. Catopsilia catilla, Cramer. Kolar, Bangalore, October; Kathlekan, November. Common.

98. Catopsilia crocale, Cramer. Kolar, October. A few specimens.

99. Catopsilia pyranthe, Fabricius. Kolar, October. A few specimens.

100. Catopsilia gnoma, Fabricius. Kolar, October; Tarikari, November. A few specimens.

101. Belenois mesentina, Cramer. Nittur, November. Numerous specimens.

102. Ixias marianne, Cramer. Kolar, October; Kippenhally, Tarikari, November. A few specimens.

103. Ixias pyrene, Linnæus. Kolar, October; Tarikari, Lukvalli, November. A few specimens.

104. Teracolus etrida, Boisduval. Kolar, October. A few specimens.

105. Teracolus danæ, Fabricius. Kolar, October; Kippenhally, Arsikari, Banavar, Nittur, November Numerous specimens.

106. Teracolus amata, Fabricius. Kolar, Bangalore, October; Tarikari, Arsikari, Banavar, Nittur, Kippenhally. Very numerous specimens.

*107. Teracolus eucharis, Fabricius. Kolar, October; Nittur, Banavar, Kadur, Arsikari, Kippenhally, November. Numerous males and a few females.

*108. Catophaga hippo, Linnæus. Kathlekan, December. One female.

109. Catophaga sp. (lankapura ?). Kathlekan, November. A single male.

110. Huphina phryne, Fabricius. Kolar, October; Tarikari, Nittur, Banavar, Kippenhally, Kathlekan, November. Numerous specimens.

111. Nepheronea sp. (gœa ?). Kathlekan, November. A few specimens.

112. Delias eucharis, Drury. Arsikari, Kadur, Kathlekan, November ; Sagar, January. Numerous specimens.

PAPILIONINÆ.

*113. Ornithoptera minos, Cramer. Kathlekan, November. A single female.

114. Papilio dissimilis, Linnæus Kathlekan, December, January. Two specimens.

115. Papilio panope, Linnæus. Kadur, November ; Kathlekan November, December, January. A few specimens.

116. Papilio hector, Linnæus. Kolar, October ; Nelamangala, January. Common.

117. Papilio aristolochiæ, Fabricius. Sagar, Kathlekan, January. A few specimens.

118. Papilio erithronius, Cramer. Bangalore, October; Lukvalli, Kippenhally, Tarikari, November ; Kathlekan, November, December, January ; Nelamangala, January. Very common.

119. Papilio pammon, Linnæus. Kathlekan, December, January. Two specimens.

HESPERIIDÆ.

120. Astictopterus salsala, Moore. Kathlekan November. Two specimens.

121. Chapra mathias, Fabricius. Kolar, October ; Lukvalli, November. Numerous specimens.

122. Tagiades obscurus, Mabille. Gersoppa Falls, January. Several specimens.

*123. Plesioneura restricta, Moore. Gersoppa Falls, January ; Lukvalli, November. Two specimens.

*124. Coladenia dau, Fabricius. Lukvalli, November. A single specimen.

NOTES ON INDIAN ANTS.

By George Alexander J. Rothney, F.E.S.

(*Read before the Entomological Society, London, 3rd April 1889.*)

The following notes (which I have been encouraged to offer to the Society by the kind assurance of my friend Mr. Edward Saunders that they might be of some interest to hymenopterists) are confined to my written memoranda of a few only of the more conspicuous or interesting of the Indian species which have been constantly under my observation from March 1872 to March 1886.

Now that I have left India, I often feel sorry I did not turn to better account such a splendid field for the study of these most fascinating insects, but the calls and duties of a business life, and the necessity of spending much of one's spare time in outdoor sports, which in India means not only relaxation but health, very greatly reduce the leisure available for steady entomological work, and, as these notes will show, almost restrict one's observations to Sundays and holidays; still there have been many neglected opportunities, and I shall always regret having failed to find the female of *Dorylus*, and to dig up a satisfactory nest of *Holcomyrmex indicus*.

Looking back on Indian ants generally, it is strongly impressed upon my mind by many an unrecorded observation that not only do different species vary as widely in habits and character as do the numerous and distinct nationalities inhabiting this wonderful country, but that individuals of the same species will occasionally exhibit, when under apparently similar conditions and circumstances, different little traits and dispositions, so that if you attempt to fix any hard and fast lines as to ant-conduct you are apt to find your calculations and theories somewhat upset.

Mr. Edward Saunders has kindly assisted me in determining some of the ant-puzzles, and I am happy to say that my Indian collections of Hymenoptera are now in Mr. Cameron's able hands for description.

Camponotus compressus, *Formica compressa*, Fabr.

The Black Ant of India.

This species is very common in Bengal, and can be seen in numbers almost everywhere, but it becomes comparatively rare as you get up-country to Oudh, the North-West Provinces, and the Punjaub, where

its place seems to be taken by *Myrmecocystus viaticus*; the two species can be taken in the same locality, but as *viaticus* becomes common, *compressus* is seen less frequently; Benares, Agra, and Lahore are good illustrations of this. *Compressus* is very common in Madras, and I have also taken it in Bombay. The nests are formed in the earth at a depth of several inches, generally under the shelter of trees, and are very populous. The sexes swarm in May or early June, and take flight as soon as the sun goes down. Stray specimens of the sexes, however, may be taken at light from the commencement of the hot weather to the end of the rains (April to September). The workers-major are very fierce and strong, and attack when disturbed with the greatest courage; if you allow them to fasten on your hand they can draw blood with ease, their strong mandibles cutting like a pair of nail scissors; when once they get a good hold, unless you unlock their jaws, they will leave their heads fixed in the wound rather than loosen their bull-dog grip.

It is amusing to watch the havoc these big workers will play with the white ants (Termites) whenever they get the chance. Very probably the trunk of the tree under which *compressus* has formed its colony will be plastered with the covered ways of Termites; take a stick and uncover these, and *compressus* will immediately rush in and carry off the soft helpless Termites to their nest; but they never have the sense or industry to open up any of these prolific finds for themselves, even when the key or start is given them, although with their immense strength they could very easily do so.

It is a very common occurrence to find evidence of deadly family feuds between these warriors, such as two lying dead, locked together, and another walking about with a big head fixed to a leg or antenna: but of many observations of a similar character, I will relate the details of a particularly desperate fight that took place in the verandah of my bungalow in Barrackpore between a worker-major (not a very big specimen) and a nest of that pungently stinging ant, *Solenopsis geminatus*. One afternoon in May, 1880, at 4-30 p.m., I noticed a worker of *compressus* very busy skirmishing round a column of the verandah, in which was a strong colony of *Solenopsis*; she contented herself for some time in cutting off and snipping in two the stragglers from the nest, but by-and-bye she became bolder,

and came closer to the nest, seizing and cutting away with the most systematic determination; by stooping down a little you could distinctly hear the snip, snip of the mandibles as they severed heads and bodies of the apparently unoffending *gemminatus*. This went on till 5-30, when *compressus* commenced an attack on the main entrance to the nest itself; and now the fight became more general. After a rapid dash at the entrance *compressus* would retreat, covered with these little red ants; some would be jerked off, but the more pertinacious required individual clearing, and I noticed *compressus* adopted a very clever plan of freeing her legs from the enemy: say one or more ants were holding on to her leg, she would then encircle that limb with her mandibles above the hold of the red ants, and then, instead of moving the jaws, would draw the leg through, a process very like shredding currants; of course *gemminatus* would often get a hold where this process could not be applied, but *compressus* always managed to free herself at last, and then off to the entrance again for a fresh attack. Twice while watching, *compressus*, covered with red ants, rolled from the base of the column to the steps below, but as soon as she freed herself, up she mounted again and renewed the fight. At 6 o'clock I went for the usual evening drive, and left my friend hard at it. On my return at 8 the fight was still going on, although it was then dark, and *compressus* was showing evident signs of exhaustion. At 9-30 I went out again to see how matters stood, and found *compressus* still alive, but covered with foes and almost done to death. I picked her up, cleaned off the red ants, brought her indoors, put her in a comfortable open box, and prepared some syrup of sugar and sherry, but on going to the box the next morning I was grieved to find her stiff and dead. I have always regretted I did not mix her syrup with brandy or port instead of sherry, but I fear she was past recovery. After bringing her in the night before, I went back with a light and gathered up some of the dead from the battle-field, and of the odds and ends of heads and bodies. I made out next day some 53 slain, but the total must have been much greater, as I did not succeed in picking up in the defective light of a wall-lamp, anything like the whole of the killed. I should be inclined to estimate the total as near 150 to 200. I did not observe any wounded; *compressus* did her work too effectively for that.

Beyond a pure love of a good scrimmage I can offer no suggestion as to any reason or cause for this fight; *gemminatus* was wholly unoffending, and *compressus* might have left the battle-field with colours flying any time from 4-30 up to 8 p.m. I have seen many instances of *compressus'* pugnacity when coming across other ants, or crossing close to another nest, but never such a systematic determined affair as the one described. I have this Hereward of ants in my collection now, with a few odds and ends of the slain. I have examined a great many nests of *compressus*, but have never succeeded in finding in them any other species of ants, Coleoptera, Aphidæ, or indeed insects of any kind.

Myrmecocystus viatica (Fabr.).

Cataglyphis viatica.

This ant is common in the North-West Provinces, Oudh, and the Punjaub. I have also taken it in Tirhoot, but never in the Calcutta district. It forms its nests in the hard-baked earth in the most exposed situations, and seems to revel in the hot dry air and fierce sun of these parts. You can always find plenty of nests in the broken ground about Agra, and also in the pathways of the gardens at Benares. The workers, which vary immensely in size, can be found busy and active all the year round, but the sexes I have only obtained in May. The workers have a strong propensity for marching about in irregular lines of a dozen or twenty together; they march at a great pace, but I have never been able to detect any particular object in these excursions, and have never seen them attacking other ants, or bringing home any plunder. The workers-major, however, are very fond of carrying their smaller brethren when on the march, which they do by striding over and holding them clear of the ground with their mandibles; if you disturb them the big worker drops the little one, and each makes off on its own account, but if left alone, and you watch quietly for a little time, you may see the big ant pick up the little one and march on again in a great hurry, and as if to make up for the delay. I have examined many of the nests of this species, but never found any slave-ants or insects of any kind in them. The big workers are powerful ants, but do not possess the immense strength of the giant workers of the *compressus*.

Camponotus sylvaticus, Oliv.

This is a common species in Bengal, and can be found on most tree-trunks; it delights in shade, and forms its nests (which are never populous) in the ground under leaves. The workers are very active and extremely fragile, and it is difficult to secure perfect specimens. Specimens even from the same nest will vary greatly in colour.

Polyrhachis lævissimus, Sm.

This ant forms its nests in the decayed wood of trees, covering the entrances to its burrows with a thick papyraceous material, which might be best described as a "small-hands" made in the substance of a "tissue"; it is by no means a common ant, and I have hardly found half-a-dozen nests during my residence in India. and these have all been in Bengal. My finest nest is situated in a tree (a species of Acacia) in Barrackpore Park, on the south side of the tennis-ground, close to the Chirya Khana (aviary). This nest has a web stretched across a portion of the decayed trunk fully 18 inches broad by 2 feet in length, and is very populous; this nest swarms about the commencement of the rains, June 15th to July 7th. It is a strikingly handsome species, with its shining jet-black head and body, relieved and set off by the red legs. It often reminded me of our English *F. fuliginosa* in general appearance and habits, and always seemed like an old friend, but though I spent many hours for many years watching this nest, I never detected any special trait or character worth recording. I never found any other species in the nest nor Aphidæ, and, as far as I could observe, the ants derived their nourishment from the rich, black, moist mould of the decaying wood. They are a gentle species of ant, and can be handled without inconvenience.

Polyrhachis Schrinax, Roger.

This ant forms its nest by binding together with one or two silky threads a couple of leaves of a shrub; it only contains a few individuals, and is decidedly rare. The same remarks apply to *Polyrhachis bicolor*, Smith.

Polyrhachis spinger, Mayr.

This is a common species in Bengal, but the nests are not easily found; they are formed by web-work binding together a few twigs

of a spiny shrub like a dwarf babool, and I have not found them in any other plant. This species was described from specimens taken in the Botanical Gardens, Calcutta.

Pseudomyrma bicolor, Guer., Sm

Sima rufo-nigra (*nigrum*), Jerdon.

This species (the female of which is figured and described by Frederick Smith in the Entomological Transactions for March, 1875, from my specimens taken at Barrackpore) is very common in Bengal: it forms its nests in the dead (but not decayed) wood of trees, and it can always be met with scouring over the trunks, particularly of fruit-trees, like the mango (*Mangifera indica*), bael (*Ægle marmelos*), and lychee (*Nephelium Litchi*). Though so generally common, the nests are not easy to find, and I only met with two thoroughly well-established colonies that could be visited and watched year after year (the first was situated in a tree in Barrackpore Road, opposite the Park-gates, just where the trunk-road turns off by the Club; the other in a small tree in the Park, in some waste ground by the viceregal kitchen-garden. These nests I have spent hours in watching from 1874 to 1886). It is a very pugnacious species, and attacks almost any insect that comes in its way; I say almost, for I have seen it distinctly avoid the big workers of *compressus*, and on one or two occasions also the workers of *Œcophylla smaragdina*, when placed at a slight disadvantage in the way of position and numbers; it is armed with a very powerful sting, which inflicts by far the most painful and lasting wound of any hymenopterous insect I am acquainted with, and I have had experience of the stings of most Indian bees, wasps, and ants. It is very possible this may be considered by many who know the ant as too high an estimate of its stinging powers, but there are stings and stings. I have had hundreds of casual ones, and thought no more of them than of the stings of a *Polistes* or *Pompilus;* but once allow this ant to get a firm hold with its mandibles, and then, doubling its body, plunge its sting, so to speak, up to the hilt, and go on stinging, and the result is an entomological experience that few would care to try again. I have had several of these little experiences, and will give the following details of the worst:—

I was out collecting in Barrackpore Park, and one of these ants got on my left hand and stung me just under a heavy snake-ring I

was wearing. I was foolish enough to allow it to operate in the above-mentioned thorough fashion before I brushed her off, and never thought of removing the ring until the finger was too swollen to do so. On my return home I tried to reduce the swelling with ice, but without success; the whole hand puffed out, the inflammation extending right up the arm to the shoulder; the finger itself turned blue, and looked and felt like bursting. I spent a wretched night, and the first thing in the morning sent to the bazaar for a native jeweller (Johari), who cut the ring off for me, but it was a painful operation, and it was two days before I was quite right again. I was in perfect health at the time and in the football training, which will give some idea of the effect of the poison when *rufo-nigra* has sufficient time to make a really deliberate and well-sustained sting.

In my compound at No. 45 Cantonment, Barrackpore, I had a very fine baël-tree, covered every year with fruit, of which my mali (native gardener) was especially fond; but the tree was much frequented by *Pseudomyrma*, and little "Adjun-mali" never went up to pick the fruit without expressing many anathemas on this particular species of ant.

I have never found any swarming time for this species, but have taken specimens of the winged female at different times during the hot weather and rains, but generally in May; but altogether I have not captured more than about twenty specimens. From May 20th to 24th, in 1879 to 1882, I captured each year a single female sitting on a leaf of the mussel-shell creeper, *Clitoria ternatea*, on the east side of the Chirya Khana (aviary), Barrackpore Park, and in almost the same position. What the attraction for this particular spot was I could never make out, and there were no nests in the immediate neighbourhood.

Wherever you find this species in any numbers, if you watch a few moments, you will see a mimicking spider, *Salticus*, running about amongst the ants, which it very closely resembles in appearance, much more so in life than in set specimens placed side by side; in my two favourite nests I have seen numbers on the most friendly footing with the ants, though I have never seen them enter their burrows. I have never seen these spiders doing anything, or capturing any fly or other insect, though they are always very busy

and in a great hurry; they are very quick in their movements, and are difficult to capture, and, being very fragile, good specimens are not very easily obtained. I have at times fancied I have seen them imbibing some of the moisture from the bark where it has been bruised or chafed, but I cannot be certain: they are evidently on a special footing with the ants, and are, I should say, the only friends *Pseudomyrma* has, with the exception of a sand-wasp, a new species of *Rhinopsis* since described by Mr. Cameron, which also very closely mimics *rufo-nigra*, and which, on first observing amongst the workers, I took to be the male. It is very active; I have seen three specimens (but only captured one), two at the nest in the Barrackpore Road, and one at the nest in the Park.*

S. rufo-nigra appears to be fairly omnivorous, preying on live insects, such as flies, moths, other ants, or anything it can capture; it is also very fond of over-ripe fruit, and there is a species of fig in the Park, the fruit of which (about the size of a medlar) is always riddled with these ants. I have not, however, found it on carrion, as I have the workers of *Dorylus* and *Solenopsis*.

I have never observed the workers fighting amongst themselves in the immediate neighbourhood of their own nest, but on other trees it is not an uncommon occurrence to find little parties of six or eight engaged in deadly battle. In May, 1883, I found five couples locked in a death struggle on the trunk of a casuarina-tree; I secured them, and they did not let go their hold on being put in the collecting-bottle, but died as they fought. It seems probable that these were workers from different nests engaged in hunting, and a common object had brought them into collision.

S. rufo-nigra and *Œcophylla smaragdina*, Fabr.—In 1883 *smaragdina*, which had never for the previous ten years been a very common ant in Barrackpore, appeared in large numbers, and advanced from tree to tree along the trunk-road; it came up opposite the Club and the Park-gates, where the road turns round to the parade-ground and Pulta. I watched the position of affairs with much interest, as

* It is perhaps curious and worthy of remark that a species of *Ampulex* should so exactly mimic this ant and mix with it on friendly terms, whilst another species, the handsome *compressum*, should behave towards it in the somewhat overbearing and rough manner I have elsewhere described.

smaragdina had only the road to cross,—one big tree and one telegraph-post,—and they would be on to my favourite nest of *rufo-nigra*. This was in March, but it was not until April that *smaragdina* crossed the road, and I observed the workers gathering in numbers about the end of the big tree and the telegraph-post, but my tree was still unmolested. On Sunday, April 29th, however, the fight commenced; *smaragdina* were clustering round the tree, and making futile efforts to ascend, for *rufo-nigra* mustered in strength in a ring round the base of the trunk, and successfully repelled every effort of *smaragdina* to effect a lodgment. Ant for ant *rufo-nigra* was far more than a match for *smaragdina*, and the *yellow* ants were routed by the *red and black*. There were (as far as I could see) no killed on either side, and when I left, after watching some hours, *rufo-nigra* was master of the situation, and *smaragdina* retiring to the big tree and telegraph-post.

The next Sunday, May 6th, I again visited the tree, and to my suprise a great change had taken place in the position of the two species. There were no yellow ants round the base of the tree, but *smaragdina* appeared in great numbers high up on the trunk on the north side, and were descending towards the *red and black* in the shape of a wedge, the base spreading almost across the north side of the trunk, then tapering off to a point, the apex being formed by a *single* ant supported by *two*, the *two* by a line of three or four, and so on. When I arrived this *spear-head* of ants was about two feet above the entrance of *Pseudomyrma's* nest (which was a little on the west side of the tree); it was not advancing, but almost stationary, the only movement being made by the few forming the apex: *rufo-nigra* clustered in numbers round the entrance to their nest, but did not attempt any counter move in force or combined effort; they contented themselves with light skirmishing with the point of the *smaragdina* formation, but here, though they tried many times, they could make no impression; *rufo-nigra* invariably engaged yellow ant No. 1, the apex; No. 1 instantly backed on Nos. 2 and 3 in the second line, which brought an enemy on either flank, which was too great odds, and *rufo-nigra* would have much difficulty in disengaging herself. This went on for some hours, till I had to leave. I never saw any killed, but the apex of the yellows was once or twice relieved from

the rear: *rufo-nigra* was evidently much alarmed, crowding round the entrance to their nest with a restless unmeaning action and generally scared look.

I could never make out how *smaragdina* arrived at the upper part of my tree; either they must have ascended on the south-east side (which was not so much frequented), when *rufo-nigra* was not on the alert, or they must have gone up the telegraph-post and travelled along the wires, which just at one point touched a few of the leaves of my tree. The trees on the right and left of my tree did not touch.

On Sunday, May 13th, I again visited my tree, expecting to find *smaragdina* in possession, but the reverse was the case; there was not a single yellow ant on it, *rufo-nigra* being in sole charge, and the work of the colony going on as usual. What had happened in the meantime I had no means of telling, but I think *smaragdina* must have left the tree of their own accord, and were not driven off.*

On Sunday, May 20th, I again went to my tree, to find another invasion of *smaragdina*, and the wedge-shaped column of yellow ants advancing as on May 6th; this time *rufo-nigra* hardly offered any opposition, and there was a very apparent diminution in their numbers.

On Thursday, May 24th, *smaragdina* had again deserted the tree, and *rufo-nigra* was to the fore.

On Sunday, June 10th, another invasion: *smaragdina* all over the tree, some workers being close to the entrance to *rufo-nigra's* nest; very few of *rufo-nigra* workers about, and these all small-sized specimens; the *red and black* ants almost suppressed.

On Sunday, June 24th, *smaragdina* occupied the upper portion of the tree, *rufo-nigra* the lower, and had regained their nest.

On Sunday, July 22nd, I found *smaragdina* strongly in the ascendant: very few workers of *rufo-nigra* about.

After this date I left off taking *written* notes, but *smaragdina*

* It is possible that as the spear-head formation of yellow ants advanced to a level with *rufo-nigra's* nest, the *red and black* ants may have retired; it would be impossible for *smaragdina* to follow them up, as their size would not permit them to enter the burrows. The yellow column may have then passed on, and *rufo-nigra*, issuing in a body, taken them in flank, and by this skilful manœuvre snatched a victory from defeat; but of course this is mere conjecture, though more unlikely things do happen in ant-life.

gradually deserted my tree, and passed on to others; *rufo-nigra* was left in undisputed possession, but the colony was never so populous and prosperous again, and on my leaving India, in 1886, had not entirely recovered from these invasions of the yellow ants.

In the 'Entomologist's Monthly Magazine' for 1876, pp. 87, 88, I have very fully described a curious phase in the history of this ant, and the beautiful sand-wasp, *Ampulex compressus;* how, on the 1st June, 1876, on the trunk of an old peepul-tree (*Ficus religiosa*), on the road to Pultah and Barrackpore, I found a number of these wasps and ants engaged in a series of battles, or what really describes it more accurately, wrestling-matches, the wasps jerking the ants clear off the tree one after the other: there would be a little fencing and dodging for a hold, especially when two ants at the same time faced a wasp, but *Ampulex* always succeeded in jerking them off the tree. The ants did not appear to be hurt, and I watched several re-ascend the tree and try another fall with their too-powerful opponents. This tree was always much frequented by both *Ampulex* and *Pseudomyrma*, but I have never seen any "tumasha," as the natives would call it, of this sort going on there, either before or since; but on May 20th, 1883, on a peepul-tree in Barrackpore Park, I observed a single specimen of *Ampulex* jerking ants off the trunk, mostly *rufo-nigras*, but in this case there was some apparent reason; both ants and wasps were attracted to the same spot by some sort of sticky secretion exuding from the bark, and ants and wasp consequently collided, with the result that the former were jerked off as described; only a few of the *rufo-nigras* offered any opposition or made any fight, and as before, none of the ants appeared to be much the worse for their falls.

Pseudomyrma carbonaria, Smith.

Sima carbonaria, Smith.

This species is not uncommon in Bengal, and forms its nests in trees, as with *rufo-nigra*. I have only found one or two nests, and these were not populous; my best one was situated in an india-rubber tree (*Ficus*), on the drive from Government House to the Outram Statue, Calcutta. I have only taken one specimen of the winged female. The sting of this ant is sharp and pungent, but not to be

compared in power to *rufo-nigra*. There is a species of *Salticus* which mimics this ant, but it is very rare, and there is another spider which also frequents tree-trunks, and closely mimics a *Camponotus*.

Œcophylla smaragdina, Fabr.

This well-known ant is common in Bengal, and forms its nests in trees by drawing together the living leaves with a fine white web, as described in Jerdon's 'Madras Journal.' In 1883 immense numbers of this ant appeared in Barrackpore, advancing from tree to tree along the trunk-road from Calcutta, and they soon took up a strong position in the Park; some of the trees were covered with nests, which are very populous. I noticed that the various *nests* on any *one* tree appeared to form *one colony*, and to live on friendly terms, whereas the ants on a neighbouring tree would be inimical; this I proved by keeping a nest in my verandah for several weeks at a time, and trying a few simple experiments. I found that ants brought from any nest from the same tree as my captive nest were immediately recognised as friends, and received with evident signs of satisfaction; but specimens brought from nests from any other tree were immediately attacked, and unless rescued were killed in the most savage manner. The longest test was only three or four weeks, for by that time my captive ants always began to show signs of failing health, so that I never had the heart to keep them shut up for a longer period. I tried to keep them healthy by a daily supply of fresh leaves, and fed them with sugar, plantains, and other fruits; but they took most kindly to green *Geometra* larvæ taken from newly-made nests of *Eumenes conica*, which were generally handy in the verandah, but either captivity did not agree with them, or I failed in my mode of treatment, for after the third week my captives invariably became more or less feeble and sickly. The following are extracts from my diary:—

May 6th. Brought home with me (with considerable difficulty) a fine strong nest of *Œcophylla smaragdina*, and arranged a comfortable home for it in a large open box in my verandah, isolating it by standing the box on a tin pot resting on a large brick, the brick standing in a large earthenwere saucer of water.

May 24th. Introduced four ants taken from another nest, but

from the same tree; these were at once received with marked signs of pleasure, were caressed, and entered the nest with their friends as if perfectly at home.

May 27th. Introduced ten specimens taken from a different tree: these at once showed signs of alarm, and endeavoured to escape; but most of them were seized, and would have been pulled to pieces had I not rescued them.

June 3rd. Introduced some more strangers, who showed alarm and immediately made off till stopped by the water; the captive *smaragdina*, though showing signs of hostility, were too feeble to make any serious attack.

I repeated this experiment many times, varying the intervals of introducing friends and strangers from a few days up to the three weeks, but always with the same result. I then altered the conditions somewhat, and on June 10th cut a fine populous nest from a tree and placed it on the trunk of one a few hundred yards distant, inhabited by another colony. The ants from my nest immediately took possession of the fork where I had placed the nest, overpowering the few ants that happened to be about; but others came streaming down to repel the invaders. My nest continued to pour forth its swarms, and soon the trunk was covered with masses of struggling yellow ants. It was, as far as I could judge, a drawn battle.

I then withdrew my nest, and hung it up to the trunk of a tree frequented by *Pseudomyrma rufo-nigra*. Out sallied the yellow ants, and *rufo-nigra* in alarm made off, and in doing so showed a great amount of discretion; they had not the numbers to make a stand-up fight, but their superior individual strength enabled the few that were attacked to deal out some rapid and effective strokes with mandibles and sting, to wrench themselves clear and escape without injury. I then took the nest of *smaragdina* back to the tree from which I cut it, and the ants were at once received with every sign of pleasure; and, although hundreds must have been left behind on the two trees, the nest appeared to be as populous as ever.

On another occasion I hung a nest of *smaragdina* to a small Palmyra palm in my compound, which was occupied by a strong nest of the yellow wasp, *Polistes hebræus*, but the ants and wasps did not come into contact in any way, although they were only separated

about two feet. In this my observations did not agree with the late Mr. Chas. Horne's, who found that *Œcophylla* had a great antipathy to *Polistes;* and in his paper on Hymenoptera from the North-West Provinces gives a very interesting account of the attacks of the yellow ant on the yellow wasp ; but in my case the ants were not quite under natural conditions, which may easily account for their leaving the wasps alone. And I was never able to find *Œcophylla* and *Polistes* inhabiting the same tree ; but I think the observation is of interest as tending to show that ants under slightly altered conditions will often show different traits of character or instinct.

During the time I kept *Œcophylla* in confinement I found they were very stupid in any efforts they made at escape; they would occasionally tumble off the brick island into the water, although within an inch would be a bridge purposely arranged for their use. When *Œcophylla* did fall in the water they collapsed and drowned at once, and seemed incapable of making any attempt to save themselves by swimming an inch or two. Some nests I kept in a large open tin-lined box, which held them securely until the tin lost its smooth surface from exposure, and allowed the ants a foothold, but even then they were very slow to escape.

Diacamma vagans, Sm.

This species is very common in Bengal. You never find it in large numbers, but generally singly, or two or three together; its nests, which are never populous, are usually formed under bricks, stones, or in brick-work, and always in shady situations. It appears to have no regular time for swarming ; its sting is sharp, but the pain does not last more than a few seconds.

In the verandah of my bungalow at Barrackpore I had a nice little nest in the brick-work, which I watched for several years, and used to feed the workers with sugar and other sweets. I arranged a little island by means of a brick placed in the centre of a large plate filled with water, covered the brick with sugar, and then with a piece of bamboo made a bridge from the floor to the brick. I left this the whole of one Sunday, but no ants found out the treasure. The following Sunday I captured a *vagans*, marked her with paint, and put her to the sugar ; she immediately seized a grain, crossed the bridge, and made off home to her nest, distant about 35 ft., in a

fairly direct line. After depositing the sugar she was out again in a few seconds, made her way back to the island, took another grain of sugar (she usually selected the largest), then back to the nest. I watched about a dozen journeys, and after the first two her track was as near a straight line to the sugar as could be. A few workers came out from her nest and stood about the entrance, but she took no notice of them. I do not know how many journeys she made that day, as I had to leave for the evening drive.

The next Sunday I arranged the sugar island in the same place. There were a good many ants of different species walking about, but none found the way to the sugar. In about an hour out came my marked ant, and after a little wandering about found the bridge, and then followed the rapid journeys to and fro with the sugar. She never appeared to eat any herself, her great desire being to get all she could stored in her nest.

The next Sunday the same process went on, but with this slight difference: this time some of her own fellow-workers seemed inclined to follow her and watch her movements, and my marked ant, after going one or two direct journeys, then altered her mode of travelling to a very irregular and zigzag course, and generally assumed a casual and uncertain air. I watched her closely, and am quite certain she wished to bamboozle her friends, and keep all the credit and "kudos" of bringing home the treasure to herself. She kept up these round-about journeys to and from the island until I left for the usual drive.

I carried on these experiments for many successive Sundays, but no other ants from this nest found out the island. A small species of *Tapinoma* did, and came in numbers every Sunday, and at last a worker of *vagans* from another nest at the other end of my verandah, distant about 50 ft., found out the bridge, I think by accident, but had the enterprise to cross, seize a piece of sugar, and off to her nest. After this I always had a marked ant going backwards and forwards with sugar on the left side, and an unmarked ant doing the same on the right side, and little *Tapinoma* swarming all over the place with the grains, but no other ants found out the sugar island. Sometimes the two workers of *vagans* met on the brick or bridge, but never took any notice of each other; they were too much wrapt up in their work for that.

I should mention that I always arranged my island within a few feet of the same spot, and now I often wonder why I never changed the position completely, and then watched the result.

After reading Sir John Lubbock's most charming work on ants, I thought I would try a few simple experiments to see if I could influence my ants by means of colours. I first scattered sugar about my verandah for a day or two, by which means I attracted considerable numbers of ants of different genera and species, particularly *Diacamma*, *Solenopsis*, and *Tapinoma*. I then placed sugar on different coloured cards (subsequently substituting the intensely brilliant colours of surface-papers for the cards), making various changes from time to time according to my judgment. These experiments I kept up for a good many weeks, but I could never find that colour influenced my ants in any way. I do not attach any value to this, as my experiments were very crude, and generally interrupted by the gaps of from Sunday to Sunday, and I only mention the circumstance as affording some traits of ant character. *Tapinoma* was always first at the sugar, and swarmed indiscriminately over everything alike.

Diacamma vagans was fairly quick at the sugar, but appeared to be influenced chiefly by the card nearest her nest, and perhaps in some degree by the one with the finest grains.

Solenopsis gemminatus seemed only to blunder on the cards by accident, and without, as far as I could observe, any particular signs of intelligence. *Tapinoma* ate sugar on the spot, and also carried off grains. *Diacamma* carried off the sugar as fast as possible, but ate none. *Solenopsis* ate sugar on the spot, but did not carry any away.

By alarming the ants by striking the cards, shaking the paper, or dropping fine powdered sugar on them, *Diacamma vagans* and *Tapinoma* would give a little start, but, recovering themselves instantly, would seize the nearest and biggest grain, and make off at express speed. *Solenopsis* would start, sometimes tumble over one another, and then make off in alarm and without any method or precision. According to my idea, *Diacamma*, by a number of little traits which I cannot describe, but which as a whole made a great impression on me, showed the most intelligence, *Tapinoma* the most audacity. *Solenopsis* I do not like to judge rashly from an imperfect

human point of view, so will only say I was disappointed with them generally. I never succeeded in frightening my ants by noise alone; noise had always to be accompanied by an earth tremor or wind.

I several times endeavoured to keep workers of *vagans* in captivity but never with any success; they swarmed up the sides of my highly polished tin-box with ease, and in my island arrangement, which kept *smaragdina* in perfect security, they found their way with wonderful rapidity to the brick surrounded by the moat, and then took to the water without a moment's hesitation, and with one or two strokes with their legs they got over the two or three inches of water with almost the ease and dexterity of a water-boatman.

On one occasion I put two workers in with *smaragdina*. One escaped at once; the other was seized, but fought her way clear, and followed her companion with splendid determination and quickness. It would require much ingenuity to make a receptacle that would safely and conveniently confine this clever ant.

In Barrackpore Park, on the river-drive half-way between "Scandal Point" and Tittaghur Bridge, at one of the prettiest spots in the most beautiful park in Bengal,—I might almost say in India,—is a fine old banyan-tree (*Ficus indica*), with foliage almost touching the ground; it stands on the green slope below the drive, and the breeze, blowing straight up from the broad Tittaghur Reach, makes the shade of this tree delightfully cool in even the heat of May or June. There is in this spot a stone culvert running under the road, the mouth of it opening in the deepest shade of the tree, and on the stones of this culvert you can find almost all the year round, but particularly in the hot weather and rains, numbers of the workers of *Diacamma vagans* congregated together in couples, and engaged in what I take to be a process of shampooing. Two ants will face each other, and fence about and caress with their antennæ, now advancing, now retiring a little; at last one will give a little spring on to the back of the other, and gently and tenderly hold her with her mandibles; then the caressing with the antennæ is renewed, and the legs are also brought into play, and used in much the same way; and lastly, the mandibles will be run gently up and down the limbs. During this operation the ant under treatment will keep time with her antennæ, and stretch out her limbs with evident delight and

pleasure: there can be no doubt they thoroughly enjoy themselves. You may watch couples in various stages of this process, which is varied at times by three ants taking part, or by one affecting a kind of coy resistance.

I have mentioned that, although *ragans* is a common ant, you cannot find it in large numbers; neither can you start out from your bungalow collecting with an absolute certainty of finding it; but for *ten years* a visit to this culvert under the shade of this banyan-tree on the river-bank always rewarded you with an interesting group of playing, caressing, shampooing ants. During these ten years I only twice found nests of this species within the radius of this banyan's shade or its immediate vicinity, so that, as a rule, my ants must have travelled some distance in order to enjoy and disport themselves in this delightful retreat.*

I must leave my favourite *ragans* now, for I have no more *written* notes, but from numbers of unrecorded observations extending over the years from March, 1872, to March, 1886, I always look back on this species with much affection, and as an old friend who, under any circumstances and tests, has never disappointed me. Judged from a human point of view (which, however, may not be always strictly fair), I certainly place *D. ragans* as the most intelligent ant it has been my pleasure to observe, and I consider *Chlorion lobatum* the most intelligent amongst sand-wasps.

Solenopsis gemminatus, Fabr.

Solenopsis gemminata, Fabr.

This species is one of the very commonest in Bengal; you can come across it everywhere. It is the *red ant* of India, as *compressus* is the *black*, and *smaragdina* the *yellow*. It forms its nests, which are very populous, in the ground, under bricks or stones in brickwork, or almost anywhere. It appears to swarm several times in the year from March to October, and I have even found the winged sexes in

* I could never find out if the ants that frequented this culvert at any one time were all from the same nest, but I am inclined to think, from their numbers and the smallness of the colonies of *vagans*, that sometimes they were not. I have observed this shampooing going on in other similar situations, but never with the regularity and certainty of this favoured spot.

the cold weather from November to February. The workers vary greatly in size, some of the workers-major having immensely-developed heads, but you seldom meet these big fellows walking about; they seem to keep to the nest of good deal, and all my finest specimens have been found by opening up a nest. These ants are very fond of forming covered ways from one point of a colony to another, or in crossing a road, and they both tunnel and build up and are very clever in availing themselves of any little irregularities in the ground, by which they can save themselves labour. For instance, on a piece of smooth even ground, they will build up a covered way, but if their track comes across a stone they will tunnel under it; if a big brick they will skirt the side of it. They do not completely cover in their ways along the whole line; a great part of the track will generally consist of two walls only. The medium-sized workers, as well as the small, take part in these works, but the giant-headed fellows I have never found engaged.

These ants will come into your bungalows and clear off any loot that may be about, and they seem particularly fond of meat, or any insect you may kill. Supposing you have a flight of cockroaches (*B. orientalis*) come into your room at dinner-time, and in self-defence and to preserve say your soup or glass from being used as a bath you kill one or two, and leave the bodies on the ground, in a very short time, long before you have finished your meal, you will see these bodies apparently become endued with a new life, and travelling at a quite rapid pace across the floor; it is swarms of the little workers of *Solenopsis* carrying off the booty to their nest.

In one bungalow at Barrackpore I had a colony in my verandah formed in one of the masonry columns, and divided into two parts, one in the base and one in the capital, and up and down the column between was a continual stream of ants passing. It occurred to me one day to cut off this passage, which I did by soaking a punkah-cord in kerosine oil, and tying it tightly round the centre of the column. The ants on either side soon surged up in masses to within an inch of the cord, but none could cross the oily barrier. I then formed a little bridge with a piece of bamboo, and fixed it in the brick-work, making a clear span over the cord, and the ends being fixed well in the crowd of ants. I then watched for an hour, but no ants found their way

across. I then conducted two or three over, and waited an hour; one of the led ants recrossed, but no others availed themselves of the bridge. I then went for the usual evening drive, and on my return after a couple of hours I found the ants crossing the bridge in numbers. I repeated this experiment many times with exactly the same result. Say barrier fixed at 3 p.m., bridge erected at 4 p.m., and a few ants led over; at 6 p.m. no ants had availed themselves of the bridge, but at 8 p.m., on my return from my drive or tennis, the bridge would be in general use; but never while looking on did the ants avail themselves of the passage, except as mentioned by a led ant recrossing.

On one or two occasions I captured a worker of *Diacamma vagans*, and placed her above the kerosine cord; without a moment's hesitation she ran up the column to the capital, made her way rapidly through the red ants, then along a beam to the next column, then down to the floor of the verandah, and off to her nest without a pause.

Solenopsis offer many strange contrasts of character; they are very clever in making their covered ways, and in finding their own booty, such as described, but when you apply artificial tests of intelligence they altogether fail, and seem to be strangely slow and disappointing.

Holcomyrmex indicus, Mayr.

This ant does not appear to be generally common in Bengal. I have taken it at Nischindipore Nuddea, and in Barrackpore Park, but never in Calcutta or its immediate neighbourhood. It is very plentiful in Barrackpore Park, in the private grounds close to Government House, where it delights in making its nests in the red kunka (ballast) roads, or on any hard dry patch of ground that can be found amongst the grass. The ants swarm early in June, and during the hot months from middle of March to the middle of June you can easily find the nests by the great mounds heaped up round the entrance of empty seed-vessels or husks of grass-seed, I may call it chaff; these mounds will more than fill a pint measure, and I have seen some which I think would fill a quart. If you watch you will see a continuous but straggling stream of ants disappearing down one of the small round entrances to their nests, each carrying a grass-seed, which they bring from the neighbouring grass, and another stream will be seen emerging with the chaff, which they heap up round the

entrance in irregular mounds: when these mounds begin to assume any dimensions the labour of piling up the husks is divided; the ant that brings one out will throw it down just outside, or will mount a short distance up the mound, when another will meet and take on the husk and add it to the top, or when the mound is a certain height, will shoot it down on the far side to prevent its tumbling back on the entrance of the nest. Sometimes three or four ants will be engaged in this process, bringing out, passing on, piling up, and shooting down. The ants bringing in the full seeds collect them amongst the grass, which at this time of the year is dry and ripe, and consequently much of the seed is on the ground. I have never observed them ascending the grass-stems to collect the seed. As soon as the *rains* commence—about June 15th—the ants seem to disappear, and although you can find specimens about up to October, they are decidedly scarce.

I have tried very many times to unearth one of these nests, but never (except in one instance) with any success. Directly you dig down a few inches in the hard bricky soil you seem to lose all trace of ants and nest. I have tried various instruments—a garden-knife, a long bodkin, and a kourpi (a very handy native tool)—but have always failed; the way the ants disappear is almost like magic. No doubt I ought to have tried a kodali (native spade), but extensive excavations where these ants formed their nests were hardly practicable without obtaining the permission of the Park authorities, which I never took the trouble to do at the time, though now I have left India I never cease to regret that I did not dig down several feet deep and a yard or two square.

The one exception I have alluded to was a very small nest, situated in the Viceregal kitchen-garden part of the Park, and where the soil was a sort of stiff clay instead of brick-rubble; the tunnels were very small and fine, and there was nothing peculiar about their formation, but in the centre, a few inches from the surface, was a small oval chamber, perfectly smooth and dome-shaped; in this were arranged a number of little round seeds, set out like cheese-cakes on a baker's tray. From the habits of this species I should be inclined to call it the "harvesting ant of Bengal." It was described by Dr. Mayr from my first specimens, which were taken at Nischindipore, having been kindly forwarded by my old friend, the late Mr. Frederick Smith.

Pheidologeton laboriosus, Smith.

This species can generally be found in the neighbourhood of Calcutta or Barrackpore, but it requires a little searching, and I do not think it would attract the notice of any one but an entomologist. The workers vary most immensely in size, the workers-major running through several distinct grades, and no one who had not observed the nest itself could suspect any connection between the noble, handsome, rich red-brown giants of the first grade with the little insignificant yellow workers-minor. These ants form their nests under bricks, stones, flower-pots, rock-work or any spot offering shelter and shade of this nature. You occasionaly meet with them on the march, probably changing their head-quarters, and when doing so they invariably form elaborate and carefully constructed covered ways. The little yellow workers-minor and the smaller grades of the workers-major you may meet with in the open, but the giant workers I have never found except by opening up a nest or covered way. All the workers are pugnacious, and when handled attack you freely, and the small yellow workers and the smaller grades of the workers-major with some effect, but the giants are perfectly harmless, and it makes one feel quite sorry to watch these huge, brave, conscientious, handsome fellows doing their very utmost to grip you with their mandibles, and doubling in their body, as if with the intention to sting, but with absolutely no result.

In forming their covered ways the workers-minor and the smaller grades of workers-major work together most industriously, carrying and piling up the little pieces of soil with great quickness and dexterity, but I have never observed the giants of the first grade so engaged; they, I think, have a special work to perform, which I will describe.

On the river-drive in Barrackpore Park between Scandal Point and Titaghur Bridge, and close to the latter, I found, in the first week of the "rains" in 1883, a splendid covered way in course of construction across the road, which at this point is about 20 ft. wide. There were a large number of ants at work piling up the little red pieces of soorki—(ballast; the soil anywhere about Calcutta or Barrackpore seems to be largely composed of brick and ballast)—and I noticed several of the giant workers also very busy, *not* carrying or

building up, but slowly making their way along the line, and here and there stopping and rearing themselves up against the walls, pressing together, and smoothing out in a way which their great size gave them special facility for doing. They used themselves much in the same way as I have seen my mali smooth over the earth with a board when doing a little gardening with belatee (Europe) seeds, or as some of the local rajmistris will also use a board in building a wall. I visited this covered way on a good many successive days, and always found the *giants* busy in this work; they would stand on their hind legs, spread themselves out, and bind together with an even kind of pressure the little blocks or grains of building material. If you picked one up she immediately attacked you in the same thorough, loyal, but perfectly impotent, manner, and when you replaced her she resumed her consolidating form of work. I had (until finding this covered way) often wondered what special use these big fellows served, but I now feel certain this battening process is one. This covered way was cut to pieces and destroyed by the carriages driving up and down every evening, and as regularly repaired by the ants in the early morning. This went on for several weeks, when the ants seemed to pass on, and I lost sight of them. The workers, in traversing their covered way, carried about with them quite an assortment of odds and ends, amongst which I have noticed the larvæ of a Rhyparochromid bug in contiderable numbers, sundry other larvæ unknown, a species of weevil, small shells (*Bulimus*) in some numbers, bits of stick or twigs, seeds, head of an ant, &c.

Dorylus (*longicornis ?*).

Before leaving for India, in 1872, my kind old friend, Mr. Frederick Smith, gave me specimens of the workers and male of *Dorylus*, and thoroughly imbued me with the necessity of discovering the female, and I started for the East with the most perfect confidence of doing so. On my way across from Bombay to Calcutta I stopped at Jubbulpore to visit the Marble Rocks, and while at dinner at the hotel a male flew in to the light; this was my first introduction to this ant, March 6th, 1872.

I had not been long in Calcutta before I found a very promising-looking nest under a large stone at the bottom of an empty tank on

the Alipore side of Fort William. I visited this nest two or three evenings a week for some months, feeling certain that some evening my persistence would be rewarded by finding the ants swarming and capturing the female; but I was doomed to disappointment, for on going to the tank one evening I found the water had been let in, and it was being filled for military purposes. I next took the workers in some considerable number in a purchase of pot-plants made at an auction sale at Mackenzie Lyall's; but my next real nest was at Scandal Point, Barrackpore Park, in the earth, and sheltered by one of the wooden seats which are erected there. I examined it very carefully, probing the burrow with a straw, but, though the workers sallied out in some numbers, there was no sign of a female. I was uncertain whether to dig the nest up then and there, or to watch it for some indication of swarming before disturbing the ants. I unfortunately decided on the latter course, for when I went to the spot the next evening there was not an ant to be seen.

My next nest was found in a small brick culvert leading from the old bear-pit, Barrackpore Park, and was formed under a lot of rubbish made up of bits of brick and decayed leaves. This was a fairly populous little colony, and looked a very likely find, and I visited it for several weeks, until one of the Park malis (gardeners), siezed with an extraordinary fit of industry, took it into his head to clear out and tidy up this old drain, which had not been disturbed for years. After this I did not find what might be considered a genuine nest until 1886, but stray lots of the workers could often be found about the Park, particularly at the back of the lions' and tigers' cages, where the old bones were thrown, and which you could generally count on finding covered with the workers; indeed, an old bone or piece of meat seemed to be an irresistible bait to the workers of *Dorylus*.

The males are never found with the workers, but come into your bungalow at night, attracted by the light, generally at dinner-time, when the lamps being turned up the white cloth forms a special attraction; they come buzzing in and blunder about the room much like a *Scarabæus* beetle, and when handled they work vigorously about with their bodies and clip you with the strong claspers of their genital armature. They are by no means uncommon, but what is very

curious is that they usually appear at the end of the cold weather or the commencement of the hot, that is, from middle of February to middle of March, when winged ants of other genera can hardly be found.

My last nest of *Dorylus* was found on the Esplanade, Bombay, on January 29th, 1886; it was my last visit to India, and I was starting for an evening walk, when not a hundred yards from the clock-tower of the University I noticed a strong body of the workers very busy round the entrance to a burrow just at the edge of the tuft, and a second glance showed me they had some object in this burrow that they were particularly anxious and jealous about, and, stooping down, I pulled out what from the colouring of the head, legs, and antennæ (so exactly like the workers of *Dorylus*), if I did not actually believe, I at least fondly hoped was the *female*, which I had been looking for for so many years. I rushed back to the Esplanade Hotel, got my collecting-bottle and a knife, returned to the spot, and this time dug up the nest without waiting. I found two more of these suspicious-looking insects, and from the curious, fussy, jealous, and at the same time half-respectful, behaviour of the workers, my hopes as to the genuineness of my find considerably rose. I got three nice little bottles filled with rum, and by the next mail sent them off to Professor Westwood and Mr. Edward Saunders, who kindly wrote me by return of post that my capture was only the "*larva of some Lamellicorn beetle.*" What *Dorylus* does with these larvæ I should much like to know; but my fondest hopes were dashed to the ground, and after fourteen years of careful search I left India, I fear for good, without finding the *female* of *Dorylus*.

Lobopelta diminuta, Smith.

This ant is common enough in Bengal, but I have never found any nest; it is always on the march, and moves in lines two deep, and from a few feet to many yards long. The longest column I have met with was in the Botanical Gardens, Calcutta, and measured a little over thirty yards. It marches at a great pace, and seems to prefer shady and damp situations; a number of the workers will always be seen carrying their pupæ with them, which they do by holding them under their bodies, and walking as it were over them.

Lobopelto chinensis, Mayr.

A common ant in Bengal, but only found in small numbers at a time, sometimes only single specimens, and generally crawling about drains or damp shady ground.

Meranoplus bicolor, Smith.

This pretty little species is common in Bengal, although you only find it sparingly as to numbers; it forms its nests in the earth at a depth of a few inches, and these seldom contain more than twenty to thirty individuals. I have only once found the winged sexes in the nest, *viz.*, in May, 1873, in the Eden Gardens, Calcutta, when I took one female and several males (as described and figured in Frederick Smith's paper in the 'Entomological Transactions' of March, 1875). I have since taken one or two specimens of the female, but always singly. The workers walk about singly or a few together, and very much resemble, both in appearance and habits, the females of some of the small species of *Mutilla;* indeed, I have at times captured a worker of rather above the average size, thinking I had something new in that genus.

Plagiolepis gracilipes, Smith.

Query also *Hypoclinea gracilipes*, Mayr.

This ant is common in Bengal, and can generally be found running about between the stems of the smaller species of bamboo, or behind jaffri (trellis-work), and similar shady situations. The workers are very active, and always seem busy carrying about various species of insects. I have some specimens before me taken with a species of *Pediopsis* (Homopteron) and *Nysius* (Hemipteron), which appear to form a very favourite form of capture.

Aphænogaster.

There are two species of this ant, which are not uncommon in Barrackpore Park in the hot weather; they form their nests in the dried-up grass-covered ground of the open and most exposed positions. One species covers the entrances to its nest with the fallen leaves of the tamarind, acacia, and a thorny shrub like the babool. The other makes tiny mounds of the little pink and blue flowers of a weed that grows amongst the grass; these little mounds, about the diameter

of a rupee, and perhaps from one-eighth to one-fourth inch high, are very pretty objects, and from their bright colour easily catch the eye.

Crematogaster Rothneyi, Mayr.

This pretty little species, which was described from specimens taken in the Eden Gardens, Calcutta, also occurs in Barrackpore Park, but does not appear to be generally common in Bengal; it frequents the trunks of trees, but I never succeeded in finding the nest.

The Mushroom Ant.

There is a species, one of the *Ponerida*, the males of which come in numbers to light, and settle on the white cloth at dinner-time, or fly about the lamps; it is common from the beginning of the hot weather in March to the beginning of the cold season in November, but I have never been able to find either the workers or females to which it belongs,—that is *knowingly*. From the very strong smell which it has when handled, and which exactly resembles mushrooms, I have given it the above MS. name.

A LIST OF THE VENOMOUS SNAKES OF NORTH KANARA; WITH REMARKS AS TO THE IMPERFECTIONS OF EXISTING RECORDS OF THE DISTRIBUTION OF SNAKES, AND FACTS AND STATISTICS SHOWING THE INFLUENCE OF *EUHIS CARINATA* ON THE DEATH-RATE OF THE BOMBAY PRESIDENCY.

By Mr. G. W. Vidal, C.S.

(*Read at the Society's Meeting on 9th January* 1890.)

The recent contribution to the Society's Museum of a specimen of *Trimeresurus trigonocephalus* from North Kanara adds another species to the comparatively long list of venomous land snakes, of whose occurrence in that district there is already an authentic record.

The list now comprises 9 species, as under:—

No.	Name of Species.	By whom recorded and where deposited.
1	*Naja tripudians*, the Cobra	Specimens deposited in the Karwar Museum.
2	*Ophiophagus elaps*, the Hamadryad.	(1) Live specimen sent to the Society's Rooms by Mr. H. T. Ommanney, C.S.; (2) skins contributed by Col. Peyton deposited in Society's Museum.
3	*Bungarus cœruleus*, the Krait ...	(1) Preserved specimen deposited in the Karwar Museum; (2) specimen contributed to the Society's Collection by Mr. H. S. Wise.
4	*Callophis nigrescens*	Preserved specimen deposited in Society's Museum by Mr. G. Vidal, C.S.
5	*Trimiresurus strigatus*	One specimen contributed to the Society's Collection by Mr. H. S. Wise.
6	*Trimiresurus trigonocephalus* ...	One specimen contributed to the Society's Collection by Mr E. H. Aitken.
7	*Hypnale nepa*, the Carawala.....	(1) Specimen contributed to the Society's Collection by Mr. G. Vidal, C.S.; (2) specimen contributed to the Society's Collection by Mr. H. S. Wise.
8	*Daboia Russellii*, the Chain Viper	Specimens deposited in the Karwar Museum.
9	*Echis carinata*	Specimens deposited in the Karwar Museum.

As regards the number of species found, Kanara is decidedly ahead of any other Bombay district. It is a sort of border land where the *fauna* of the densely-wooded and humid Malabar Coast is found side by side with the *fauna* of the dry and bare Deccan plains. The above list, moreover, is probably by no means exhaustive. Sooner or later other tree vipers, specially *T. anamallensis*, which has strayed from the Anamallay Hills to the Mahim Woods near Bombay, may be found in Kanara, together with other representatives of the *genus Callophis*.

But although Kanara shows a large *variety* of venomous snakes the mortality from snake-bite in that district is comparatively low. As will be seen from the statistics given further on, the deaths from snake-bite only average 0·037 *per mille per annum*. The reason for this comparative immunity is that dangerous snakes, and, in particular, the *echis*, which—as I shall endeavour to show later on—is *the* chief instrument of destruction in Western India generally, are not found in inconveniently large numbers, while the Hamadryad and the Krait are decidedly rare.

As our collections increase it is useful to take stock from time

to time, however limited may be the field of inquiry selected, to see what additions have been made to our knowledge of the distribution of species. In no branch perhaps of Natural History has the distribution of species been so incompletely worked out, as in the case of the *Ophidia*. A glance at the existing works of reference will show how very little is known of the *habitat* of the great majority of the species described.

Take the case of this particular Tree Viper now received from Kanara. Günther says it is *peculiar* to Ceylon, and Theobald and Nicholson mention no other locality in which it is found. According to the same authorities, *T. anamallensis*, another Tree Viper, of which several specimens, live and pickled, have been procured by members of our Society at Khandalla and the Mahim Woods, occurs only in the Anamallays and the Wynaad. A third tree viper, *T. strigatus*, obtained in North Kanara by Mr. H. S. Wise, has previously been found only in the Nilghiris and the Deccan. Similarly, *Callophis nigrescens*, of which we have specimens both from North Kanara and Mahableshwar, occurs, according to the books, only in the Nilghiris, the Shevaroy Hills, the Wynaad and the Anamallays. Another Callophis, *C. trimaculatus*, whose *habitat*, according to the same authorities, is Tennaserim, and *possibly* Bengal, has lately been received in the Society's Museum from Colaba (Bombay) and Bandora.

In these and scores of similar instances the incompleteness of the record is not without some excuse. But the meagre account of the "Phúrsa" (*Echis carinata*), to be found in all works on Indian snakes, is less excusable. Günther says it is common in many parts of the peninsula of India, in the Anamallay mountains, and in the vicinity of Madras. Fayrer says it is absent from Bengal, common in the North-Western Provinces, the Central Provinces, Punjab, and generally in the south of India. Theobald says it inhabits North-Western and Central India, the Punjab, and Southern India, while Nicholson merely remarks that is not common but widely spread. No mention is made by any of these authorities of the extraordinary abundance in which this viper is found in Sind and the Konkan. The remarkable facts disclosed by the annual official returns showing the results of the measures taken for the extermination of venomous

snakes, have been completely ignored. To show the abundance of the *echis* in the Ratnagiri District alone, I give below the number of these snakes killed and brought in for rewards during the six years, 1882-87, in that district, as compared with the total number destroyed in the Bombay Presidency the same period :—

Number of Snakes (*Echis carinata*) destroyed in Ratnagiri		Number of Snakes destroyed in the Bombay Presidency.	
Year.	Number.	Year.	Number.
1882	238,981	1882	262,348
1883	243,675	1883	293,230
1884	167,603	1884	221,566
1885	240,158	1885	283,579
1886	208,535	1886	266,921
1887	255,378	1887	311,476
Total ...	1,354,330	Total ...	1,639,120
Average of 6 years...	225,721	Average of 6 years.	273,186

I have not at hand the figures for the whole of British India for all the above years. But I find that in 1885 and 1886, the total number of snakes killed in all India is recorded as 420,044, 417,596, respectively. Thus it may safely be concluded that of the whole number of snakes annually destroyed throughout British India, considerably more than one-half, consisting almost exclusively of individuals of the *Echis* species, are killed in Ratnagiri alone! These figures convey a very fair idea of the strength of the "Phúrsa" community in this locality, though they by no means represent the maximum possible number of "Phúrsas" which might be destroyed, if more vigorous measure were adopted. But one looks in vain for any mention of the occurrence of the *Echis* in Ratnagiri in all the books dealing with Indian snakes. It is not indeed very many years since the then head of the Bombay Medical Department, in a list of the poisonous snakes of India, with vernacular names attached,

published for the guidance of District officers under the authority of Government, *omitted all mention of the Echis carinata*, and declared the "Phúrsa" of Western India to be identical with *Halys Himalayanus!*

I have assumed above that all or nearly all the snakes destroyed for rewards in Ratnagiri belong to the *Echis* species. In making this assumption, I am relying on past personal observation, as well as arguing from the natural probabilities of the case. The totals may include a few Cobras and Daboias, and possibly a few harmless snakes sometimes find their way into the bags. But the number of snakes other than 'Phúrsas' brought in for rewards in Ratnagiri is so insignificant that for all practical purposes it may be treated as a *quantité négligeable*. The truth is that no other snakes but the *Echis* are, or can be, systematically hunted and found in great numbers. A band of professional snake-charmers would think themselves lucky if they bagged a pair of cobras after a day's search in likely places. A party of Ratnagiri 'Phúrsa' catchers would curse their luck considerably, if their take of 'Phúrsas' averaged less than 50 a day. It is on record that in 1862, when the reward for 'Phúrsas' was tentatively increased from six pies to two annas a snake, 115,921 'Phúrsas' were killed and brought in for rewards in Ratnagiri within eight days (December 2nd to 10th)! At the same rate, had the reward been continued without limit as to total expenditure, five millions of 'Phúrsas' would have been destroyed in one year. But after this alarming display of zeal, the rate of reward was promptly reduced to its former level. The real truth is that notwithstanding the enormous number annually destroyed in Ratnagiri for years and years past, no really serious impression has as yet been made on the 'Phúrsas.' This is clearly shown by the fact that the mortality from snake-bite in Ratnagiri has not sensibly diminished in the last ten years. The reason is that a *limit* is fixed on the total expenditure on rewards.* The rate now in force—three pies per snake—is sufficiently high to make 'Phúrsa' hunting a profitable business. But as no rewards are paid, after the limited grant for the purpose is exhausted, the annual campaign is incomplete and ineffective, and the enemy is left in possession of the field with only

* The limit some years ago was Rs. 50 per taluka per month.

such losses as can easily be repaired by the natural fecundity of its species. With the same rate of reward and no limit of expenditure, except the natural limit, when 'Phúrsas' become so rare as to make their pursuit a waste of labour, these snakes, if not quite exterminated, would soon be so reduced in numbers as to be no longer a pest and a constant danger to the population. If the campaign were *vigorously* conducted it would not, I believe, be a very long one. For a year or more the 'Phúrsas' would be killed by millions, instead of as now by lakhs, but the total expenditure would probably not exceed the aggregate and comparatively useless expenditure of the past fifteen years or so.

I have given above some instances showing more or less excusable omissions in the record of distribution of species. But far worse than these omissions is the surprising error made by Dr. Günther himself, when he gravely states, that "no case is known of its (the *Echis*) bite having proved fatal." At the present day this statement can hardly need refutation. Even as far back as 1855-56, Dr. Imlach, then Civil Surgeon of Shikarpur, in a description of the 'Kapar' (*Echis carinata*), published in the Transactions of the Bombay Medical and Physical Society (*Vide* Vol. III., New Series, p 80), wrote that "a reference to police returns will show that in by far the greatest majority of cases serious injury and death have been caused by the bite of this species." The records of the Ratnagiri Civil Hospital for the last thirty years will tell a similar tale. But even Sir Joseph Fayrer does not seem to have had sufficient information on the subject to enable him to correct the error when he wrote his Thanatophidia. He merely states that "it (*Echis carinata*) is venomous, but Günther says its bite is not known to have proved fatal. This, I think, very doubtful. One in my possession killed a fowl in four minutes, another in two minutes, and a dog in about four hours."

There is indeed no doubt that the *Echis* is a far more potent factor than any other venomous species in swelling the mortality of the Bombay Presidency, and it is important that this fact should be more generally known and recognised than it has been hitherto. It is, of course, impossible to show the exact percentage of the deaths from snake-bite for which the *Echis* is responsible. In the returns

no attempt is made to discriminate the species to which the recorded deaths are attributable, and little if any reliance could be placed in the statistics, even if such an attempt were made. But the conclusion stated above may, I think, be fairly drawn from the fact, which is very clear from the returns in their present shape, that in all those districts (*e.g.* Sind and Ratnagiri), where the *Echis* is known to abound, the average mortality from snake-bite is *markedly* high, while conversely, the mortality is insignificant in other districts where the *Echis* is either rare or absent. The following table, which I have compiled with some care and labour from the official returns for the eight years, 1878—85, shows the population, the actual average mortality, and the mortality *per mille* of each district in the Bombay Presidency:—

District.	Population by Census of 1881.	Average actual mortality from snake-bite, 1878 to 1885.	Average mortality per mille, 1878 to 1885.
Hydrabad	754,624	181·7	0·247
Thar and Parkar	203,344	48·7	0·239
Karachi	478,688	87·2	0 182
Ratnagiri	997,090	154·5	0·155
Thana	908,548	108·8	0·119
Panch Mahals	255,479	30·5	0·119
Shikarpur	852,986	72·8	0·085
Surat	614,198	41·5	0·067
Kaira	804,800	47·2	0·0586
Broach	326,930	19·1	0·0584
Upper Sind Frontier	124.181	6·7	0·053
Kolaba	381,649	19·8	0·052
Ahmedabad	856.324	39·6	0·046
Sattara	1,062,350	41·0	0·038
Kanara	421,840	16·0	0·037
Belgaum	864,014	30·2	0·034
Poona	900,621	18·6	0·020
Dharwar	882,907	17·6	0·019
Khandeish	1,237,231	23·1	0·018
Bijapur	638,493	11·0	0·017
Nasik	781,206	10·8	0·0138
Ahmednagar	751,228	10·3	0·0137
Sholapur	582,487	2·2	0·003

Thus three Sind districts and Ratnagiri, in all of which the *Echis* swarms in suitable localities, stand well at the top of the list with an average mortality, taking the four districts together, of ·205 per 1000. On the other hand, in the last four districts on the list, *viz.*, Bijapur, Nasik, Ahmednagar and Sholapur, the combined average

mortality per *mille* is only ·0118 In other words only one man dies of snake-bite in about 100,000, in these Deccan districts, while in the *Echis*-ridden tracts one man dies in every 5,000. Daboias and kraits are probably nowhere so common in Western India as to have much appreciable effect on the mortality. But cobras are quite as common, I believe, in these Deccan districts as they are in Ratnagiri or Sind. This shows, I think, pretty conclusively that the *Echis*—and not the cobra, or any other venomous snake—is chiefly responsible for deaths from snake-bite in Bombay.

Enough has been said above to show the importance of having accurate and as far as possible exhaustive records of the distribution of species, and this applies not only to the case of the venomous snakes, with which I have particularly dealt, but to all branches of Natural History. Our Society has already done much useful work in this direction, thanks to the individual as well as collective energy of its members. But a great field is still open to collectors, and much still remains to be done in taking stock, and preparing catalogues of the numerous and valuable contributions already received.

INDIAN CATTLE.

By J. H. Steel, A.V.D.

(*Read at the Society's Meeting on 6th February 1890.*)

Not the least striking feature of life in India is the enormous importance of cattle, and the manner in which they are extensively concerned in trade, agriculture, traffic, and food supply. This is fully recognised in the religions of those peoples who are more essentially the inhabitants of India. Thus sacredness of the cow as an emblem of fruitfulness, and veneration of the bull as a symbol of generative power, are characteristic features of the Hindoo religion, and of these we see as outward and visible signs, the Nundee, or Sacred Bull, occupying an honoured place in the shrines, and the cow wandering freely through the streets, sleek and fat on grain appropriated from the baskets of not unwilling merchants. The sacred injunctions of the religion of the Hindoos seem to have been wisely designed with two aims; firstly, the preservation of cows in time of

famine; secondly the devotion of the *best* bulls to service as sires; in this way the welfare of the race of cattle in perpetuity was secured by the powerful influences of custom and superstition. The sacred books of Hindoo and Buddhist, the noble pillars of Asoka, and even the statutes of various conquerors and peaceful invaders of India whose fierce or rude habits have been tamed from time to time by the gentle influences of Hinduism, are full of instruction as to the care to be taken of cattle, and of aphorisms in honour of the bovine race. From time to time Hinduism has been stirred to its depths at wanton or careless affront by slaughter of cattle, and thus the welfare of horned beasts has at times had an influence on history.

But the bullock, though less reverenced than the bull and cow, is even more entitled to honour. He has done good service in every war which has been carried out in India, drawing heavy guns, siege trains, baggage, and supplies, and to European armies he has often been no inconsiderable food supply. In trade he is a most important factor; the strings of bullock carts, which pass along our Bombay streets, the long lines and large herds of Brinjari cattle we meet in some parts of the country, the kind of conveyance which we have to adopt, in the majority of cases, directly we leave the line of rail in out-of-the-way places up-country, are all evidences of this. In agriculture the plough bullock, the ox treading out the corn, and the unfortunate animals engaged at the useful but wearisome work of the well are familiar objects. In food supply the bullock of India has little concern except when he is bought up by the Commissariat at cantonments, or shipped for use by troops on active service. The cow, however, supplies in the form of *ghi*, curds, and other products from milk the staple item of *animal* food consumed by many millions in this country.

Loss of stock by disease or other catastrophe, accordingly, it will be seen, dislocates existence in India. The traveller loses his means of conveyance; the beneficent, but noisy, operation of drawing water for irrigation can no longer be efficiently performed, the ground cannot be tilled, nor the corn threshed; as the plough lies idle so also does the cart, which should be cheerily conveying produce to the line of rail or neighbouring market. Fairs cannot be held; even religion and pleasure are suspended, and military operations are

hampered and sometimes prevented by the plague which carries off cattle so frequently in times of war. This is no fanciful picture, but a stern reality familiar to district officers and veterinary surgeons, and painfully evident to Government in its effects on the revenues which are reduced to a minus quantity through the necessity of supplying grain or fresh bullocks to the cultivators.

We often hear surprise expressed that in India care is bestowed on cattle, which ought to first be given to man; but it must be remembered that in supplying to cattle adequate medical treatment, sufficiency of fodder, legislative protection from cruelty, and a special Department to look after their welfare, the public and its Government are but following the dictates of necessity, and fulfilling the requirements of human existence and welfare in this country. The Cow Protection Movement, the development of Pinjrapoles, and the retention alive throughout the country of poor brutes suffering from debility, wounds, or disease are merely exaggerated expressions of a deep current of religious feeling (and of the sound policy which underlies it) with regard to cattle. In this land of ancient and venerable faiths, various rulers have from time to time shown an enlightened policy as regards cattle protection. Even the Mogul Emperors found it judicious to repress any tendency of their followers to wound the susceptibilities of their Hindoo subjects, and, among Mussulman sovereigns, Hyder Ali and his son Tippoo Sahib of Mysore have rendered most excellent services lasting to the present day in their fostering care of the Amrut Mahal breed of cattle, one of the finest in India. History shows that the Hindoo princes, as in Kathiawar, Malwar, Nellore, and elsewhere, also have succeeded in development of fine breeds of cattle, and, indeed, the Mysore dates its fame and origin from the time of Hindoo rule before Hyder.

The Governments of the Honorable Company and that of Her Imperial Majesty have been not unmindful of this important matter. Thus, there is at Hissar in the Punjab a large and important cattle-breeding farm, the influence of which is widely spread through northern India. In Mysore until recently the Amrut-Mahal establishment at Hoonsoor was under the Madras Government, but a few years ago it was transferred to the Mysore State, and now attempts to improve breeding operations are being carried out more less

energetically throughout the different parts of the Southern Presidency by distribution of stock from a farm under the Department of Agriculture. In the Bombay Presidency there was a farm at Aligaon, near Sirur, but now a pedigree herd is being raised at the Government experimental farm at Badgaon, in Khandesh, under the Agricultural Department.

Although this important matter receives a certain amount of attention, it had long been felt that more was needed, and that special Cattle Breeding Operations should be carried out by Government similar to those resorted to for improvement of horse stock. This matter is a subject of much debate, but is now generally admitted as one of urgency and interest, for it is found that as the rail increases road traffic lessens, and trade bullocks, being less in demand, are more difficult to procure. Further, it is stated that the Brahmin bull of to-day is inferior to his predecessors, and less reliable as a father of his race, since in the course of time it has become a mere matter of form to present a male animal to the temples, care often not now being taken that the animal so presented is free from blemish, and the best of the herd. Moreover, it is thought that with multiplicity of responsibility has resulted diminished zeal for the welfare of cattle; that between district officers, agricultural officials, local magnates, and so on, the race of cattle is apt to fall to the ground. Whether these suppositions be thoroughly established or not in detail, it seems to be a general impression that the cattle of India are sadly deteriorating, that old methods of preservation are falling into effeteness through time and superstition, and that something ought to be done to arrest the decline ere it be too late.

Far from being a *laudator temporis acti*, I am a firm believer in modern progress, but I cannot blind myself to the following *evidences of deterioration*:—(1) Military officers have in recent years frequently reported unfavourably on the cattle supplied to them, and it is especially unsatisfactory that the Amrut-Mahal has not invariably sustained its old reputation. (2) There is a widespread opinion among agriculturists, ryots and land-owners, that the cattle of the present day are inferior. (3) Inspecting officers not unfrequently confirm this view. (4) Purchasing committees for army bullocks have to reject extensively for want of stoutness of build and for

unsoundness. (5) The Cow Protection Movement has met with an extraordinary degree of success among the agricultural classes, who are specially likely to experience the need for something to be done to improve or prevent deterioration of their cattle. The movement is a sign of the times, even though Sriman Swamy's views be extreme, and his statements and statistics erroneous.

This deterioration is perhaps to an extent to be traced to an unwillingness on the part of the powers that be to interfere between the Native and his cattle; there is a lurking idea that it is bad policy and unpopular for Europeans to have anything whatever to do with Indian cattle, and that, moreover, the Natives know very much more about the cattle of India than Europeans do. Also many Europeans look upon cattle as below their notice, for it is only the district officials who fully realise their importance. But it is bad policy to look upon anything as too common to be worth our notice; on the contrary, the mere fact of the ox rendering us important services entitles him to our best aid and sympathy. That action of the authorities in regulating cattle-breeding would be unpopular is a purely gratuitous assumption, and is disproved apparently by the fact that in many parts of India at various times Native Governments have regulated cattle-breeding with vigour and success, the best breeds of the present day having thus been developed.

That Natives know very much more about cattle than Europeans is a fallacy; they have more crude empirical knowledge as regards cattle management and working, but the sum total of their information is very small and local. The best European authorities on Indian cattle are much better acquainted with the subject than are the Natives, but this is not saying much, for a very great deal has yet to be learned! Among those who have contributed to our knowledge of this important subject are Gilchrist, a surgeon on the Madras Establishment, long serving at Hoonsoor, who wrote a book on "Diseases of Horned Cattle in India"; the late lamented Dr. Shortt, whose small book on Indian Cattle gives useful information; and Professor Wallace, in whose book "India in 1887" are accumulated and arranged photographs of various kinds of cattle, with a description of each in the letterpress. Smaller contributions have been made to the subject but altogether our information is very inconsi-

derable, and will well admit of expansion and systematisation. In the Government Records are numerous Reports of Cattle Diseases and cognate subjects which deserve careful study, and the official cattle statistics of trade, population, attendance at fairs, imports and exports ought to be carefully worked out if we would thoroughly realise the importance of cattle to India. A little study will show that although Natives know how to feed cattle in this country and can select them for work with much skill, their knowledge fails most lamentably when it comes to deal with injuries and disease, so that the unfortunate animals when most they need scientific care and special nursing, are subjected to barbarous cruelty of treatment, or to utter neglect. Fortunately Government and the public now recognise this unsatisfactory state of affairs, and are taking measures to remedy it.

Much confusion exists even in native nomenclature; for example, we often find a number of terms used in description of cattle which have a very general significance, but might be mistaken to be the names of breeds; thus Hanum cattle are those which come from "down-south" and might be taken to mean Mysori in some parts of the country. In reply to a letter asking the true meaning of the term, I was on one occasion informed it was applied to very small but beautifully-shaped breed of cattle of the Mysore stamp, and coming from the western part of that State, where they run practically wild. Khilari means simply "herd" cattle as contrasted with those tended individually, and Deshi means simply common country cattle. Talabdai, again, is the term applied in Guzerat to local village cattle which have more or less of the blood which we know as Guzerathi. The frequency of these general terms is apt to mislead a casual observer into multiplying breeds unnecessarily and erroneously.

The ox of India is recognized as a species distinct from that of Europe, and is termed by Zoologists the Zebu or Brahmini Ox. The respects in which he differs from his European cousin are—(1) the presence of a hump, (2) lightness of build and agility, (3) large size of the dewlap, (4) certain minor differences of colour and shape. The principal characteristic consists in the presence of a hump. This is similar to the hump of the camel, and consists mainly of fat

mixed with the natural fibrous and muscular structure of the withers. It is ornamental and a sexual mark, being much larger in the bull than in either bullock or cow; it varies in size in different breeds, and must be considered as a storehouse of nutriment, serving to adapt the animal to periods of famine exigency which occur frequently in the course of Indian life. In the calf it is not seen, but develops as the animal grows older. Its firmness is a good index of the condition of the animal and is used for this propose by bullock-men who feel it critically but who (with many Europeans) are entirely mistaken in imagining that the presence of the hump is essential to working bullocks. Evidence to the contrary may be seen any day in the Bombay streets, where numerous half-starved bullocks with no hump work under the yoke. No doubt a good full hump and a fat yokerest, well suited for its work and little liable to gall, go together, but the bullock is in no way dependent on his hump for ability to work under the yoke. (2) The lightness and agility is due to the animal having to range far and wide to pick up his living, and having to do work much more frequently than the European ox. Although in many parts of the world cattle are commonly worked, India yields to none in the value of her draught breeds. as England yields to none in her rich beeves. Thus we arrive at an important axiom as regards cattle-breeding in India, that *for working breeds we need not go outside of India for new blood though if we wish to breed for beef and milk, something may be done by crossing with English and foreign breeds.* This axiom is constantly to be held in remembrance, and neglect of it may lead to serious ill-consequences. (3) The fine full dewlap of Indian working cattle is supposed to at times attain such a degree of development as to interfere mechanically with the animals when trotting. This idea seems very widely accepted, and is received by Professor Wallace, but the evidence of its truth is doubtful and inconclusive.

The Zebu is a species which has undergone much modification, so that now there are numerous varieties or breeds. In the south of India the most important breed is the Mysori, which attains its highest development in the Hallikar variety of the celebrated Amrut-Mahal bullock of Hoonsoor. These are excellent animals for fast draught, being quick and light in action, plucky and enduring; they

are generally steel grey or white in colour, with an intelligent expression, long straight sharp horns inclining upwards and backwards, and often running parallel from swollen longitudinal ridges on the forehead. They are not very large, although bullocks of this breed of considerable size are sometimes seen. Besides the three varieties of the Amrut-Mahal, Hallikar, Hagalwadi, and Chitaldroog, there are a number of sub-breeds of local varieties of Mysoris, for example the Madesvaram Betta of large size, and the Kankanhalli of small size. In the Punganoor zemindari of North Arcot good cattle of the Mysore stamp, but small, are bred. The influence of the Mysore breed extends northwards to Bombay on the Western Coast, and to beyond Secunderabad in the Nizam's Dominions, but an intermingling with other breeds occurs rather extensively, and in some of the countries of the south, as also along the Kistna. Kaveri. and Godaveri Valleys. and in the Southern Maharatta Country, the country cattle almost attain the importance of distinct breeds on account of their size, strength, and special shapes. On the Coast, too, is found a small breed of beautifully agile cattle used for very light and fast draught. Wallace, with his usual zeal for creating breeds, terms them Diminutiva. But, even if it were for a moment accepted that they were a distinct race, some more suitable name could be found than that.

The first serious competition northwards that the Mysoris meet is from the bullocks of Ongole or Nellore. These have short sharp horns, long pendulous ears, large dewlap, massive frame, and large size. They are grand looking animals, very useful for slow work but not specially active. The cows are good milkers. Animals of this variety are good-tempered and tractable. The sterling qualities of these cattle have secured them a very wide range, which, however, seems to be gradually becoming restricted. They are found in the Hyderabad Contingent Artillery, and as gun bullocks are most imposing in appearance, but slow. In the Cuddapah and Bellary districts they are used extensively under the plough. The breed has been tried up at Hissar, but is not a favourite there; still it is doubtful if it is well represented by the bulls brought north as typical, and the same remark applies to Mysoris. Time will not permit further notice of Madras cattle; though the Salem breed, Trichengode

milkers, and the Kangayen variety (the Coimbatore), are deserving of mention.

In the Bombay Presidency the Guzeratis first demand consideration. They are large, slow, good-tempered, noble in appearance, and good workers in plough or along country roads. Their form of horn is characteristic and regular, the twist is outwards then upwards, and having a final turn at the tip, and for their medium length the horns are stout. They are justly considered by Wallace to be "decidedly the finest of all large cattle of the North-West of India, and only equalled by the Kistna bullocks of the South." Nariad may be taken as the centre of the breed. Cattle of this kind are constantly seen in the Bombay streets in large carts, but they are slow in the extreme, are considered too soft of foot for street work, and rather more frequently unsound than the Mysore or local country breed. This is a serious matter which ought to be carefully looked into by cattle breeders. The idea may be erroneous, but there is somewhat a general impression that the breed is degenerating. The influence of the Guzeratis extends into Kathiawar, northwards into Rajputana, and eastwards to the Ghauts. Outlying sub-breeds are the Kankreji and Malwi, the former occurring on the N.-E. of Guzerat, the latter in the Satpuras. I observe that the Mhow Heavy Field Battery bullocks are recorded as principally Malwis. In Kathiawar the most characteristic animals are the Gir or Junagadh, which have secured such a reputation for milk-producing powers, that they are the principal milch cattle of Western India. They are sometimes called Suratis, but were originally brought from Kathiawar, and Wallace has recorded a tradition that even thither they were imported from the West. He details arguments in support of this view, which seems feasible, for certainly in shape of front and horns the Kathiawaris are remarkably different from other Indian cattle. In Sind is a good breed of working cattle, short-horned, and generally of a white colour; the cows are said to be good milkers; the bullocks are good-tempered, but slow in work.

In some part of the Bombay Presidency the cattle have attained a fair amount of definiteness of breed, although as varieties they are not so well-known as the Guzerati. Thus the Dangis or Hill breed seen near Igatpuri, and the well-bred race of cattle developed at

Bhadgaon, by the efforts of Stormont, ably seconded by Mr. P. R. Mehta are worthy of mention. Wallace notices the Deccani, as a distinct breed, but hardly is very successful in defining it. Where cattle are well cared for and richly fed on kurbi and grain throughout the year, they become large and strong. The Berars and certain parts of the Central Provinces thus show us beasts of a most excellent stamp. On the other hand, wherever in the hills and elsewhere cattle are left to pick up their own living as best they may, to starve all summer, and where they breed promiscuously, the race becomes stunted and degenerated.

Northwards through Marwar the Guzerati gradually become merged in the cattle of the Punjab, especially the species of Wagad, Nagar, or Hissar race, which has its centre at the celebrated Hissar Government Farm. At the farm a number of crosses are found, but there is a large, long-horned, strong bullock which has specially resulted from the efforts of this establishment and is much used for army purposes in Upper India. These bullocks are excellent for cart purposes, being docile, powerful, and of fair speed. They look rather leggy, however; and it is open to question whether for military purposes they equal the Mysori, certainly the latter, for breeding, pluck, speed, and endurance ought to take the first place among Indian cattle, but his smaller size and less weight render him less suitable for very heavy draught than either Nellore, Guzerat, or Hissar bullocks. The cows in and about Hissar, known as the Hansi breed, have attained much importance in North India as milkers. Mainly through the efforts of Syed Mahomed Hussein some of the local breeds of the N.-W. Provinces and Oudh have attained a place in Wallace's book, the Gorannea of Bundelkund and the Bagondha of Oudh are thus entered as distinct breeds, but are probably mere local sub-varieties. The Santhal cattle from the Barakur River, the Purbi or local Allahabad breed, and the small neat cattle seen near Jessore (which Wallace considers very like Channel Island stock) are rightly considered purely local. The bullocks of Burma are stout, thickset, short-horned, and excellent for cart work. Those of Ceylon are described as small, light in build, neat in appearance, and remarkably like Adens. These latter are neat, well-bred, short-horned or polled, symmetrical and they are constantly

imported into India, because of the excellent milking qualities of the cow.

Such is a hasty review of the cattle of India. The general impression one will gain from this summary is, perhaps, that India is remarkably well-off for cattle, whether for slow draught, fast work, or milking purposes. Such is certainly the case. Possibly some good in the future may be effected by crossing the Indian breeds more frequently than now, but it seems evident that if any gain whatsoever resulted from import of working cattle, say from Italy or the south of France, this would be more than counteracted by loss of stamina and of suitability to the climate on the part of the Indo-European progeny. As regards milk, the Short-horn cross would certainly increase the yield and quality, but the resulting animals would need great care, and could only thrive in cooler parts of the country. With Kathiawar, Sind, Hansi, Nellore, and Aden cows we need hardly resort to Europe for milking breeds. As regards beef, Indian cattle are, undoubtedly, very inferior, but as the demand is very limited it would probably be fully met by the Commissariat establishing a central beef farm, and distributing bullocks for slaughter to the large stations within range. It would not cost much to attach an English beef herd to each of the existing public cattle farms, and the herds might possibly be made self-supporting. In such a country as India, however, improved beef can hardly be considered a crying necessity, as the beef-eating population is in such a large minority.

Another point which is conspicuous in description of Indian cattle is the absence of well marked differences sufficient for popular description. The points by which the general varieties can be distinguished from one another are simply those of differences in size and shape which it requires a practised eye to detect, although at a glance in the case of any special animal it is possible for an experienced man to form a correct idea of his breed. This is strongly confirmatory of the view that the zebu is a true species, and has diverged far in the line of development from the ox of Europe. Whether, or no, he is a black race is a point which has been raised by Professor Wallace, but which we will not now discuss, for it is at present *sub judice*.

In the study of Indian cattle crop up numbers of questions of the utmost practical and theoretical importance into which I must not enter here, but must ask you when you read in the newspapers about traffic in hides, horns, bones, and hoofs, or concerning live stock sales, the great fodder question, vaccination of cattle, inspection of dairies, improvement of stock, cruelty to cart bullocks, cattle poisoning, ghee adulteration, meat markets, and murrains to take these notices as evidences of the great part Indian cattle have in the welfare of this grand and progressive country.

CORRESPONDENCE.

THE *ECHIS CARINATA* AND ITS ALLEGED ANTIDOTE.

SIR,—The appalling statistics of the mortality from the bite of the above snake, brought to notice by Mr. G. W. Vidal, C. S., at the recent meeting of the Bombay Natural History Society, make one shudder. It is to be hoped that Mr. Vidal will continue his interesting narrative, and let us have some authentic information on the supposed antidote discovered by a medical officer at the above civil station. In the interim please allow me to say a few words anent the "bite of the *echis carinata* and the antidote."

The bite from the *echis* (*phursa* or *kapar*) produces peculiar symptoms to any other of the ophidian *venenose* family; its *virus* liquefies, while the others coagulate the blood. Besides, a severe bite from an *echis* causes excessive hæmorrhage from the part bitten, from the gums, and from any eruption that may be on the body. Death ensues from continuous bleeding, and, I am told, is accelerated when ammonia is administered. Of course, I am open to correction.

Mr. Vidal, C. S., is doubtless aware that there exists a shrub—*Pogostemon purpuricaulis*—on the Western Ghats and at Poona, the root of which, if masticated, and also if applied to the punctured part like a plaster, it will almost instantly allay the hæmorrhage, in fact, I have learnt, it acts like a styptical charm, but only in case of the *echis*? Has the root been tried, if so, what has been the result? I have not seen Dr. Dymock's book on Indian Botany; perhaps the properties of this apparently valuable medical plant has been fully noticed by him. Mr. G. Carstensen, of the Victoria Gardens, will be able to further enlighten us most probably?

The *Pogostemon purpuricaulis*—after a great deal of trouble (qv. *Asian*, 29th October last)—I find to have a number of *aliases* or pet names, so commonly

given now-a-days by our modern botanists. Since Drury and Birdwood's (Vegetable Products) and Loudon mention nothing about this shrub, I communicated (through the *Asian*) to "Smoothbore," and am indebted to him for the following synonyms :—

Pogostemon	*purpuricaulis*	Dalz. in Hook.
Do.	*purpuricale*	Drury, Indian Flora, Vol. II., p. 59.
Do.	*parviflorus*	Benth. in Wall.
Do.	*pubescens*	Benth. in D. C. L.
Do.	*fontescras*.....	Graham's Cat., Bombay, pl. 149.
Do.	*intermedius*	Wall Cat. 2327.
Pangla		Bombay Pres.

The Secretary of the "Botanical Section, Bombay Natural History Society," I hope, will be good enough to analyse the *root* of this plant, which it is supposed to be a styptical agent, and let the members know if the alleged antidote has been proved to be efficacious in the bite of the *Echis carinata*, known to Anglo-Indians as the deadly "carpet snake."* I came to know of this plant by a friend wishing to know "What root of a shrub has styptical properties for the *echis*?"

The shrub is about five feet high, with leaves about eight inches long and velvety back; the bark is sometimes of a dark purple hue, emitting when crushed a black currant-like odour,—Yours, &c.,

N.-W. P. Jan. 20. F. R.

Sir,—As "F. R." rightly supposes, in his letter published in your issue of the 25th January, I am well aware of the existence of the shrub (*Pogostemon purpuricaulis*), and of its empirical use in cases of echis bite. In the course of the last ten years or so, I have on more than one occasion tried to direct attention to this shrub, and to stimulate further inquiry as to its supposed value as a styptic. In particular I may refer "F. R."—as he has apparently not seen it—to a note contributed to the *Asian*, I think in 1881, but haven't the files to refer to here—in which I gave all the information then available on the subject.

As far as I know, nothing further has since been elicited. I am glad, however, to see that attention has again been drawn to the matter.

The use of the root of this plant to stop the hæmorrhage, which is the most troublesome and dangerous symptom of echis bite was, if I remember right, first brought to light when Mr. J. Elphinston was Collector of Ratnagiri, about 1873 or 1874. A clerk in the Collector's office was bitten by an echis, and a Brahman, who was called in to treat the patient, produced some root, from which he prepared a paste for external, and a decoction for internal, application. This treatment was so successful in stopping the bleeding, that Mr. Elphinston made inquiries about

* The popular name of *Carpet Snake* is used by Anglo-Indians in the most careless manner, and is generally applied to the Daboia.—Ed.

the root. After some show of reluctance the Brahman was induced to point out the shrub from which it was obtained. The shrub turned out to be a very common one, locally called "Pangla," and some years afterwards I procured specimens which established its identity with *Pogostemon purpuricaulis*.

A supply of the root was obtained by Mr. Elphinston, and sent to the Ratnagiri Civil Hospital, where its value was practically tested by Dr. Christopher Joynt, then Civil Surgeon. Dr. Joynt himself treated several cases of echis bite with it, with good results, *post hoc* or *propter hoc*, as the case may have been. Subsequently—about 1880, I think—he contributed a paper, giving the results of his experiments, to the Bombay Medical and Physical Society. *Most unfortunately*, this Society had temporarily stopped the publication of its journals just about the time when Dr. Joynt's paper was received, and as I ascertained afterwards from Dr. Joynt, the original paper had either been lost or mislaid, while he himself had kept no copy of it, and had moreover destroyed, or lost the notes from which he wrote it. I understood from him, however, that he was pretty confidently of opinion that the root really possessed valuable properties as a styptic.

I am not aware if any further trials of the root have since been made at Ratnagiri, or elsewhere. Some years ago I remember sending pieces of the root to Mr. A. Bettington (late Bombay C. S.), who was interested in the matter, and wished to have the root chemically analysed. But the analysis, if any was made, revealed nothing useful.

The plant is not included in the Indian Pharmacopœia. If, as there is some reason to believe, it has the property ascribed to it, it would be a very useful addition. This, however, is a question for doctors rather than naturalists, to take up.

The shrub is called "Pangla" I believe, only in the Konkan. Above the Ghats, in Poona, Nasik, &c., it is known as "Fangal." It grows very abundantly on both sides of the Sahyadri watershed, where the rainfall is sufficiently heavy; and as "F. R." observes, its strong black currant smell is a distinctive feature. I may add that it is largely consumed about Egtupura for *rab*, that is for burning on the seed beds prepared for rice and other cultivation.

Lastly, to refer to another point noted by "F. R.," ammonia has been declared by a former medical officer at Ratnagiri, who had a large experience of cases of echis bites to aggravate rather than otherwise all the worst symptoms. The bite of this viper is apparently fatal in about 20 per cent. of cases, and the action of the poison is slow. In collecting materials for an account of the snakes of Ratnagiri for the *Bombay Gazetteer*, I found (in 1878) records of 62 fatal cases treated at the civil hospital. These cases showed that death occurred on an average in four and a half days, though in some instances patients had lingered up to twenty days.—Yours, &c.,

G. VIDAL.

Camp Gokhanta, Northern Frontier Line, January 30.

[The above letters appeared in the *Bombay Gazette*.—ED.]

THE *ECHIS CARINATA* AND ITS DESTRUCTION.

To the Editor, "Bombay Natural History Society."

DEAR SIR,—I have read with much interest Mr. Vidal's paper on "Mortality from Snakes in the Bombay Presidency." He makes special reference to the snake called "Phursa" in the Ratnagiri district. It may interest you to hear some facts which came to my notice when Collector of Ratnagiri.

Below Ratnagiri lies the large taluka of Deogad, which extends from the sea to the line of ghâts. It comprises many miles of waste rocky country, and here more especially it is that the Phursa breeds. I made particular enquiry and ascertained that in April, May and June the young are born, but they are difficult to find. Although I offered a reward of half an anna per Phursa in these early months, no one would take the trouble to look for them. In Angust and September the Mhars go out with long sticks, to which forks are attached, and catch them in thousands, bringing them into Deogad in baskets, and exhibiting them at the Mamla kacheri, where three pies Government reward is paid for each Phursa, whose head is then cut off to prevent any roguery on the part of the natives. I cannot say for how many months longer the Mhars would or could have gone on catching these Phursas, for the fnnds placed at my disposal always came to an end before the close of November.

I remember once being in a predicament on this account. I was encamped at Deogad, and fonnd the Kacheri surronnded by angry Mhars demanding the Government reward, and insisting on placing before me haskets of defunct Phursas which smelt strongly. My funds heing exhausted, I, of course, failed to satisfy them. I took the precaution to advise the Mamlatdar to go home warily with a lantern lest out of revenge they might strew his path with still living Phursas.

The rate of mortality is small when we consider that from two to three lakhs of snakes are killed during only four months in the year, and that for the remaining eight months the Phursas are unmolested. This may account for the fact that the Phursas in this district do not decrease, and that the figure of death-rate from snake bites differs but little from year to year. As a matter of fact there is but little necessity for people to go into the jungles where the Phursas are mostly to be found, otherwise we should certainly hear of many more deaths. If I remember aright, I never had more than Rs. 3,000 a year placed at my disposal for the whole district as rewards both for slaughter of wild animals and of snakes, and I could very easily have spent double this sum in the Deogad taluka alone. If our Society takes up the question and places in a clear light the necessity for exterminating the Phursa, it might be urged upon Government to spare Rs. 5,000 for the purpose, or some philanthropic person might advance the money as a work of *Dharm*. The measures taken should be systematic and thorough, under reliable supervision, and the work of extermination should last from August to February at least. It will then be a matter of wonder how many thousands of Phursas meet their death.—I am, &c.,

R. E. CANDY, C. S.

Sholapur, January 1890.

MISCELLANEOUS.

BRANCHING TREE FERNS.

In the Journal of the Bombay Natural History Society, Vol. iii, p. 250 (1888), Mrs. W. E. Hart contributes a valuable note on some Branching Palms. Is it generally known that Tree-ferns are also branched occasionally and in a similar manner? Last October I spent an hour at least during a beat for deer under the trunk of a large Tree-fern on the Rungneet Tea Estate below Darjiling, at about 5,000 feet elevation above the sea, the fern being about 30 feet in height and bifurcated at about 6 feet from the top, the two bifurcations being of equal size and height and lying very close together, and each bearing a perfect crown of fronds I am informed by a lady resident of Darjiling that there is another bifurcated Tree-fern on the Tukvar Tea Estate, and still a third on the road down to Tukvar from Darjiling, so that abnormal examples appear to be by no means rare in the Darjiling district, though the one briefly described above is the only one seen by me.

LIONEL DE NICEVILLE, F.E.S., C.M.Z.S., &c.

1*st February* 1890.

SNIPE SITTING IN THE OPEN.

Rowing down the Nageshwari River to-day, I was a little puzzled by a group of birds gathered about two scanty tussocks of about half-a-dozen rushes apiece growing on an otherwise bare gravel-bank.

I fired into them and picked up three "full" snipe (not jacks or pintails), and a fourth ran into some long grass a dozen yards away, and was not bagged.

A little lower down a fifth was put up from a similar place.

The same thing once happened to me in Gujarat; the four snipe sitting on close-cropped grass sward beside a tank at Harsol; and several pairs and single birds on equally exposed turf all round the tank.

I have seen other instances, less noticeable, in India, but never at home.

Camp Dasgaum, 17*th January* 1890. W. F. SINCLAIR.

NOTE ON LOCUSTS IN INDIA.*

The presence this year of swarms of locusts in part of Sind, Gujarat, Rajputana and the Punjab, affords an opportunity of elucidating several of the points which

* This note is compiled from a large series of reports, chiefly from those contained in the Records of the Revenue and Agricultural Department of the Government of India. These sources of information will be fully quoted in the general report which is in preparation; in the present note, therefore, though the actual words of the original writers have often been used, it has been thought best not to give references which would necessarily be extensive. It should be noticed, however, that in the case of the Bombay invasion of 1882-83 the excellent reports of Mr. J. Nugent have been almost exclusively used.

are at present doubtful in the history of these destructive creatures. The following short account is therefore given of what is known on the subject, in the hope that some of those who read it will assist in obtaining further information and specimens, so as to enable a complete account to be drawn up for publication, in the report which is being prepared under the direction of the Trustees of the Indian Museum, in connection with the general investigation of Economic Entomology which has been undertaken.

In the case of the locust of North-Western India, what are chiefly wanted are: (1) authentic specimens taken in various places both of this year's locusts and also of locusts which have proved destructive in former years, so that the identity and distribution of the species may be definitely settled; (2) information as to the permanent breeding-grounds from which the locusts come, and also as to the number of broods and the production of a second generation, when breeding takes place in the plains. Similar specimens and information will also be welcome in the case of locusts which have at different times invaded other parts of India.

Locusts can be at once killed and preserved by dropping them alive into a bottle of strong alcohol (*e.g.*, whisky) in which they will travel quite safely if care is taken to fill the bottle so as to prevent jarring.

Locusts appear from time to time over wide areas in North-Western, Western, and Southern India, besides isolated flights which occasionally appear in the western parts of Lower Bengal and in Assam. Records have been found of a number of such invasions, many of them responsible for very serious damage. Of these, the best known are the locust invasions of 1869 in Rajputana and the Punjab, of 1878 in the Madras Presidency, and of 1882-83 in the Deccan. It is to these three invasions then that we must chiefly direct our attention for an understanding of the subject.

The general received idea is that the locust which invades India belongs to the species which is generally spoken of as *Acridium peregrinum*, and which is supposed to have been the *locust* of the Bible. *Acridium peregrinum* is undoubtedly the locust which in past years has periodically done great injury to crops in Algeria, though recently a very different species has appeared there. The identity, however, of Indian locusts has not as yet been by any means definitely ascertained, and this is one of the points which require elucidation; as far, however, as we at present know there seems reason to believe that while *Acridium peregrinum* extends its ravages into the dry plains of the Punjab and Rajputana, the locust which proved injurious in Madras in 1878, and in the Deccan in 1882-83, belongs to a very different species, which is probably *Acridium succinctum*. In order, however, to settle the question, it will be necessary to examine further specimens taken from destructive flights, which have appeared in various localities, the material in the Indian Museum being at present insufficient.

With regard to the natural history of locusts generally, we may observe that all the different species which occur in various parts of the world, breed permanently in barren elevated tracts where the vegetation is sparse. In years when they

increase inordinately they descend in flights from their permanent breeding-grounds upon cultivated districts where they destroy the crops, lay their eggs, and maintain themselves through one complete generation, but are unable to establish themselves permanently, usually disappearing in the year following the invasion, to be succeeded, after an interval of years, by fresh swarms from the permanent breeding-ground.

Generally speaking, the life circle of a locust extends through one year, in which period it passes through its various stages of egg, young wingless larva, active pupa and winged locusts, which dies after laying the eggs that are to produce the next generation. The eggs are laid in little agglutinated masses in holes, which the female bores with her ovipositor in the ground. In temperate climates the eggs are usually deposited in the autumn, but in sub-tropical countries, such as India, where there is but little winter, the winged locusts live on through the cold season and only die off after depositing their eggs in the following spring. In this case the eggs hatch after lying in the ground for about a month. In both temperate and sub-tropical regions alike the young wingless locusts, on emerging from the eggs in the spring or summer, feed voraciously and grow rapidly for two or three months, during which period they moult at intervals, finally developing wings and becoming adult. The adult insects fly about in swarms, which settle from time to time and devour the crops. The damage done by locusts is thus occasioned in the first instance by the young wingless insects, and afterwards by the winged individuals into which the young transform after a couple of months of steady feeding.

In Rajputana and the Punjab in 1869 the flights were said to have come chiefly from the vast tract of sand hills (*Teeburs*) between the Runn of Kutch and Bhawulpore, and partly from the Suliman Range in Afghanistan. Locusts were reported as usually to be found in the autumn in the *Teeburs*, and it would, therefore, appear probable that this tract is a permanent breeding ground, the supposition put forward in some of the reports, that the locusts had flown across from Africa being altogether improbable. On *á priori* grounds it to be expected that the chief permanent breeding-ground of the flight that invade Sind and Rajputana will be found to be the highlands of Biluchistan, or even further to the eastward. The whole question, however, of the permanent breeding-grounds of these locusts is one that requires further investigation. The winged flights appeared throughout Central Rajputana in the latter part of the hot weather, and laid eggs which hatched as the rains set in; the old locusts dying after they had deposited their eggs. From these eggs were hatched young locusts which became full grown and acquired wings in August and September.

They were said to have laid eggs which produced a second generation in September; but this appears improbable, as locusts in other parts of the world pass through but one generation in the year, though in some cases they produce more than one brood of young. One observer reported that he had seen eggs hatched as early as March in the Punjab, and this increases the confusion. The whole

question therefore of the breeding habits of these locusts requires further investigation.

The eggs laid by the original flights at the end of the hot weather were distributed throughout the whole of Central Rajputana, and a vast amount of injury was done in Marwar, Ajmere, Kishengurh, Tonk, Sirohi, and the northern part of Meywar, the crops being damaged, in the first instance, by the young locusts before they acquired wings, and afterwards by the winged swarms which flew about the country and settled at intervals to eat what had escaped the ravages of the young wingless locusts.

In the Punjab, flights of locusts from the Suliman Range (Afghanistan), appeared in the western border (Dehra Ismail Khan) in the end of April and in May. Eggs and young locusts were also found about this time near the hills in the sandy tracts of the same district. The flights seem generally to have moved from west to east, and by July to have spread themselves throughout the Punjab (Multan, Amritsar, Sirsa, Ludhiana, &c.); but the laying of eggs and the hatching out of young went on, at least in the south-east (Sirsa, Hissar, Delhi) throughout August and September.

In Bombay, locusts were noticed in May and June 1882 in the south-west of the Presidency (Dharwar and Kanara Collectorates); but they attracted little attention, such swarms being annual visitors of the Kanarese forests, and neither in Kanara nor in Dharwar did they cause any material injury. With the setting in of the south-west monsoon, however, they spread in flights over the Presidency to the north and north-east (Satara, Poona, Nasik, Amednagar, and Khandesh), and early in the rains proceeded to lay their eggs and die. These eggs hatched in the end of July and beginning of August, and the young locusts did a large amount of damage over a wide area, through the months of August and September. In the early part of October, with the setting in of the north-east monsoon, the young locusts which had by this time acquired wings, took flight, and travelled with the prevailing wind in a south-westerly direction, doing some injury in the Poona Collectorate as they passed. They then struck the Western Ghâts and spread slowly over the Konkan in November, and thence travelled into the native States of Sawantvadi and the Kanara district. During the remainder of the cold season and the following hot weather (December 1882 to the end May 1883), the flights clung to the Ghauts, occasionally venturing inland into Belgaum, Dharwar, the Kolhapur State and Satara, and devouring the spring crops in the Coast Districts; but ordinarily keeping in the vicinity of the hill ranges. With the commencement of the south-west monsoon, however (in the latter part of May 1883), the flights began to move in a north-easterly direction, as they had done the preceding year, but in larger numbers.

At the commencement of the rains they began to alight in vast numbers over an immense tract of country, comprising the six Deccan Collectorates of Sholapur, Poona, Khandesh, Ahmednagar, Satara, and Nasik, and also in the three Coast Collectorates of Ratnagiri, Kolaba, and Thana. They deposited their eggs and died,

and early in August the young locusts hatched out in countless numbers, but were apparently more backward, and possessed of less strength and stamina than were those of the previous year. The unusually heavy rainfall killed vast numbers of them, in some parts of the country, and elsewhere the insects seemed stunted and feeble, and grew but slowly. They were destroyed in vast numbers by the vigorous measures initiated by Government officers, and were also said to be diseased and attacked by worms and other parasites As late as November, the mass of the young locusts appeared still unable to fly and made no general move, as they had done the year before, towards their permanent home in the south-west. The invasion was in fact at an end, and though swarms appeared in Sawantwadi in 1883-84, no further injury of a serious nature seems to have occurred.

The injury occasioned to the rain crops by the locusts was very considerable over a great portion of the Deccan and Konkan, both in 1882 and 1883. But it was found, at the end of the invasion, that abundance of the cold weather crops had compensated to so great an extent for the injury done to the rain crops that, on the whole, no very widespread suffering had arisen.

In 1878, when the Madras Presidency was invaded, the young locusts began to appear in January, and were found in great numbers in different districts from then on until September and October, the earlier swarms being found in the west and south of the Presidency, and the later ones in the north and east. Winged locusts were first observed in the end of March and beginning of April, in the hills to the south-west (Wynaad and Nilgiri), where they may be supposed to breed permanently Thence, aided by the south-west monsoon, they gradually worked their way over the Presidency to the east and north, finally disappearing about November and December. The information available hardly justifies any very decided conclusion as to the life history of the locust. But it may be noticed that locusts were observed pairing in the Salem District, in the latter part of June, and also that the young locusts, which were found in the early part of May, in the Udamalpet *Taluk*, were supposed to be the offspring of the large flights of winged locusts which had appeared in the preceding February in the some *taluk*. The connection between the autumn broods of locusts and those which appeared in the early part of the year has not been made out satisfactorily.

Remedies.—The following is a short account of the chief measures which have at different times been adopted in India against locusts. In this connection it must be remembered that the locust of N.-W. India being distinct from that of S.-W. India, the measures found useful in one invasion will not necessarily be applicable in another.

In the locust invasion of the Punjab in 1863, it was found that the only stage in which the pest could be successfully destroyed was while the eggs were still in the ground, or very shortly after the young had hatched. For the destruction of the eggs repeated ploughing was recommended, where practicable; while it was found that the young locusts, when only a few days old, could easily be destroyed by driving them gently into a small ditch previously dug for their reception, and then

covered with earth well pressed down. When not above a week old, a trench of six or eight inches wide and deep, such as two men could form in a few minutes, sufficed for securing the insects which jumped into it with alacrity, and appeared wholly unable to extricate themselves. In some districts eggs were purchased by weight and destroyed; but, as a general rule, it was not considered advisable that the labours of the population in destroying the pest should be remunerated by the Government.

In 1869, in the Punjab, the destruction of eggs was discouraged, as being a difficult operation and by no means certainly successful; while the destruction of the young, when first hatched by driving them into trenches, was found to be an exceedingly simple operation and certain and effectual in its results.

No general account has been found of the measures taken in Rajputana in 1869; but at least in one case, excellent results were obtained by digging a series of trenches in front of an advancing swarm of young wingless locusts; the earth being thrown up on the side away from the swarm, and each trench filled in as it became three parts full of the insects, which, like the locusts of Cyprus, were found to continue to advance despite the annihilation which resulted from their obstinacy in doing so. This makes it appear probable that the screen system which has been successfully used upon a large scale both in Cyprus and Algeria, against two distinct species of locusts, may be found applicable to the locust of Rajputana; though it has been shown to be quite useless against the locust which invaded the Deccan in 1882-83, and which declined to advance into the traps.

The Cyprus screen system consists of a series of cloth screens, from 2 to 3 feet high, bound along the upper edge with a strip of oil cloth to prevent the locust from climbing over; a long line of these screens is erected in front of an advancing swarm of young wingless locusts, so as to form an impassable barrier for them; pits are dug at intervals, close to the screens and at right angles to them, on the side towards the advancing swarm. The edges of the pits are guarded by frames, made of cloth and wood, with overhanging zinc edges, arranged to prevent the escape of the locusts from the pits. The swarms were found, both in Cyprus and Algeria, on arriving at the screen, to turn to the right and left along it, apparently endeavouring to go round it, the locusts thus poured in countless numbers into the pits, and being unable to escape, could be destroyed wholesale.

Of the measures adopted in the Madras Presidency in 1878, the most successful seem to have been the destruction of the swarms of young wingless locusts by driving them into lines of burning straw; the preventing the flights of winged locusts from settling in the fields, by lighting fires, beating drums, and waving branches and clothes in the air, as soon as a flight appeared; and the driving of the winged locusts out of the fields, when they had already alighted, by beating through the crops. It is said that in cases where winged flights were driven persistently through a number of villages, without being allowed to settle, the locusts perished without doing injury.

In the Bombay Presidency in 1882-83, various methods were employed on a

large scale to destroy the locusts, which were to a great extent kept under by the energetic measures taken against them. The Cyprus screen system, described above, was found utterly inapplicable, and had to be abandoned. A plan was devised of forming lines of beaters armed with fan shaped besoms of twigs, so close together that locusts could not escape between them, and marching the beaters from end to end of the field, vigorously beating the grass or crop in front with a view to crush the young locusts. The plan was successful to some extent in short grass, but it was evidently destructive to the growing crops and could not be tried on them. The plan of dragging rapidly, for ten or twelve yards, country blankets or *dhotars* along the surface of the field where locusts lay, and then squeezing up the cloth to kill the locusts contained in it, was found useful in thick bushy tracts, but required, for its successful working, a good deal of activity and intelligence. The most successful method employed was the bag net system, which consisted of a capacious bag, much like a huge holster case, but open at the side instead of at the end, and five or six feet deep by eight or ten feet long. This was held by two men, one at each end. The open side of the bag net was run along over the grass or young crops, and as the young locusts tumbled in, they could not get out again; when nearly full, the mouth was closed and the bag twisted up together so as to kill the locusts that had been caught. This was found to be a simple and easy means of destroying the locusts, and the people took to it readily all over the locusts-affected area. Little or no injury was done to the crops by the men working it, and millions of insects were killed.

E. C. COTES,

Indian Museum, Calcutta.

The 6th November 1889.

PROCEEDINGS.

PROCEEDINGS OF THE DECEMBER MEETING.

THE usual monthly meeting of the Members of this Society took place on Thursday, the 5th December 1889, Dr. D MacDonald presiding.

The following new Members were elected :—Dewan Bahadur Laxumanrao Jugonnath Vaidya, Mr. Vundravandas Purshotumdas, Mr. R. H. E. Thompson, Dr. H. S. G. Jayakar, Col. H. Powlett, Mr. H. J. P. Hargrave, M.I.C.E., and Dr. H. E. Drake-Brockman, F.Z.S.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged the following contributions to the Society's collections, *viz.*:—

CONTRIBUTIONS DURING NOVEMBER.

Contributions.	Description.	Contributors.
2 Martens	From the Himalayas	Mr. J. C. Anderson.
2 Owls (alive)	Strix javanica	Mr. S. W. Chart.
A quantity of fresh-water fish, &c.	From Raipore, C.P.....	Mr. J. A. Betham.
A number of butterflies, snakes, and lizards.	From Simla	Mr. A. Newnham.
2 Porpoises (alive)	Neomeris karachiensis	Mr. W. F. Sinclair, C.S.
1 Snake (alive)	Zamenis diadema	Mr. D. Wilson.
1 Dhaman (alive)	Ptyas mucosus	Mr. Smith.
2 Large wasps' nests	From Tansa.....	Mr. Shivlal Motiram, Khan Saheb.
1 Python (alive)	Python molurus	Mr. E. L. Barton.

MINOR CONTRIBUTIONS.

Mr. E. A. Corke, Lieut. J. Devine, Miss M. Bapty, and Mr. Framjee N. Davur.

CONTRIBUTIONS TO THE LIBRARY.

The Ethiopian and Oriental Representatives of the Mantidean Sub-family Vatidæ; by J. Wood-Mason, presented by the Author.

Buffon's Natural History, Vols. I. and II., presented by Mr. W. C. Rowe.

A Monograph of Oriental Cicadidæ (W. L. Distant), presented by the Indian Museum.

Report on the Mineral Statistics of Victoria (Duncan Gillies), presented by the Author.

Notes on Indian Economic Entomology, presented by the Authors.

PRESENT TO THE SOCIETY.

The Honorary Secretary stated that Mr. C. B. Lynch had very generously presented to the Society the large oil painting of tigers by Mr. R. A. Sterndale, which he (Mr. Lynch) had recently purchased from the executors of the late Mr. W. J. Best.

A hearty vote of thanks was passed to Mr. Lynch for his munificent donation.

CHIN-LUSHAI EXPEDITION.

The Honorary Secretary also mentioned that Captain Chase, of the 28th Bombay Pioneers, had kindly volunteered to collect any specimens which he could obtain for this Society during the regiment's stay in the Chin-Lushai District.

A TRIP TO AUSTRALIA.

Dr. K. R. Kirtikar then read the first part of an interesting paper, entitled, "An Indian Naturalist's Trip to Australia," which was illustrated by the various botanical

specimens, &c., which he had brought with him from Australia. The first part of this paper appears in the Society's Journal No. 3, Vol. 4, now being distributed amongst the members.

PROCEEDINGS OF THE JANUARY MEETING.

The usual monthly meeting of the members of this Society took place on Thursday, the 9th January 1890, when Dr. G. A. Maconachie presided.

The following new members were elected:—Mr. F. M. Flower, Colonel Kenneth Mackenzie, Mr. T. H. Middleton, Mr. J. Sladen, C.S., Mr. F. H. Tod.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged the following contributions:—

CONTRIBUTIONS DURING DECEMBER.

Contributions.	Description.	Contributors.
1 Sea Cucumber.....	From Singapore	Mr. W. D. Graham.
1 Painted Bat	Kerivoula picta	Mr. G. Carroll.
1 Head of Nilghiri Wild Goat.	Capra hylocrius	Mr. E. L. Butcher.
1 Head of Hyæna	Pierced through lips, nose and both eyes with porcupine quills.	Mr. W. Home.
1 Owl (alive)	Strix javanica	Mrs. Hojel.
1 Smew (female)	Shot in Guzerat	Mr. E. Giles.
1 Orange Minivet.....	Pericrocrotus flammeus	Col. Kemble.
2 Eggs of Rock Horned Owl.	Bubo bengalensis	Do.
1 Koel.....	Endynamis honorata	Capt. T. Thorburn.
Two pieces of Rhinoceros' Skin.	Tanned in Cawnpore	Col. Baddeley.
1 Cobra	Naja tripudians	Dr. Weir.
2 Silver Pheasants (alive).	From China	Capt. Nantes.
1 Golden Pheasant (alive).		
1 Rail (alive)		
A quantity of Fossil Bones.	From the Gulf of Cambay...	Mr. H. Grogan.
4 Jerboa Rats (alive)	From Bushire	Mr. Cook.
1 Antelope's head.....	Curiously deformed	Mr. F. Otto.
1 Owl (alive).....	Strix javanica	Mr. J. Bristed.
1 Head of Hog-deer.....	Axis porcinus	Mr. H. C. V. Hunter.
1 Head of Swamp Deer ...	Rucervus duvancelli	Do.
A quantity of Snakes and Lizards.	From Carwar	Mr. E. H. Aitken.
2 Phoorsas.....	Echis carinata	Colonel Hore.
2 Jungle Cats (alive)	Felis chans	Mrs. W. E. Hart.

A special vote of thanks was passed to Colonel Kenneth Mackenzie for his valuable contribution to the Society's Library, consisting of an interleaved copy of *Jerdon's Game Birds of India*, illustrated by means of photographs taken by General H. Watson.

EXHIBIT.

Mr. Thomas Drewet sent for exhibition a full-grown domestic cock with an abnormal leg, growing out at right angles to the others, under the tail.

The Zoological Collection at the Victoria Gardens.

Mr. Phipson drew the special attention of those present to the great improvements which were being carried out at the Victoria Gardens, and hoped that the members of the Natural History Society would assist Mr. Ollivant in his efforts to make the Zoological Collection a credit to the city. Open-air cages for the large carnivora were being built on a plan suggested by the Committee of the Natural History Society. One of these cages was now finished, and a pair of tigers would shortly be transferred to it. It would be seen that the cage in question consisted entirely of iron bars, on a stone plinth, and as it measured 40′ by 20′ the animals would have far more space for exercise than in ordinary cages. A new deer-park was being laid out, and a snake pit had been constructed. A supply of harmless snakes, such as pythons, dhamans, checkered water-snakes, &c., was now much wanted.

Mr. Phipson also stated that the Society had already sent the following contributions to the Victoria Gardens:—

3 Bears	*Ursus labiatus.*
4 Swans	*From England.*
2 Panther Cubs	*Felis pardus.*
7 Crocodiles	*Crocodilus palustris.*
1 Porcupine	*Hystrix leucura.*
1 Monkey	*Macacus radiatus.*
1 Monkey	*Macacus silenus.*
2 Grey Jungle Fowl	*Gallus sonnerati.*
1 Mongoose	*Herpestes griseus.*
1 Indian Palm Civet	*Viverra malaccensis.*
1 Malay Bear Cub	*Ursus malayanus.*
1 Purple Coot	*Porphyris poliocephelus.*
3 Tortoises	*Testudo elegans.*
1 Lesser Florican	*Syphcolides aurita.*
2 Toddy Cats	*Paradoxurus musanga.*
3 Snake Birds	*Plotus melanogaster.*
3 Owls	*Strix javanica.*
1 Slow Paced Loris	*Nyeticebus tardigradus.*

The following papers were then read :—

Notes on a Caterpillar Farm, by Mrs. W. E. Hart; a List of the Venomous Snakes of North Kanara, by Mr. G. W. Vidal, C S.

PROCEEDINGS OF THE FEBRUARY MEETING.

The usual monthly meeting of the Members of this Society took place on Thursday last, 6th February 1890, Dr. D. Macdonald presiding.

The following new Members were elected:—Colonel J. Waterhouse, Mr. Fred. Wright, Col. C. F. Hughes, B.S.C.; Mr. P. E. Myer, Mr. Walter Lang, and Mrs. McLaren.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged the following contributions:—

CONTRIBUTIONS DURING JANUARY.

Contribntions.	Description.	Contributor.
1 Slow-paced Loris	Nycticabus tardigradns	Gen. C. D. LaTouche.
1 Snake	Simotes russelli	Mr C. E. Kane.
2 Civet Cat (alive)	Viverra malaccensis	Mr. Pereira.
2 Snakes.....	Lycodon aulicus, Echis carinata.	Mr. A. C. Walker.
A qnantity of Birds, Insects. &c.	From Ceylon	Gen. C. D. LaTouche.
Head of Hornbill	Dechoceros cavatus	Mr. W. F. Sinclair, C.S.
Red-crested Wood-Quail.	Rollulus roulroul	Mr. Dady Maneckjee Limjee.

MINOR CONTRIBUTIONS.

Dr. Weir, Mr. J. Stiven, and Mr. I. Benjamin.

CONTRIBUTIONS TO THE LIBRARY.

	Presented by
Memoirs of the Geological Survey of India	In Exchange.
The Birds of India, Vol. I. (E W. Oates)	The Anthor.
Hume's Nests and Eggs of Indian Birds (2nd Edn.) (E. W. Oates).	The Author.
Verhandlnngen der Zoologisch-botanischen Gesellschaft in Wein, XXXIX. Band III. IV. quartal.	In Exchange.
Physiological and Pathological Researches, by Dr. T. R. Lewis.	The Lewis Momorial Committee.
The Indian Forester, August, 89	In Exchange.
Classified List of the Plants in the Botanical Gardens, Péradeniya, Ceylon.	Pnrchased.

PHOTOGRAPH.

The Honorary Secretary drew the attention of the Members present to the photograph of an African Lioness, taken by Mr. J. D. Inverarity, and enlarged and presented to the Society by the Honorable Mr. Justice Parsons.

A NEW BUTTERFLY.

The Honorary Secretary read a description of a new morphid butterfly *Stichopthalma nurinissa*, n. sp., by Mr. L. de Nicéville, of Calcutta. The new butterfly, drawings of which were exhibited, differs from *S. Nourmahal* in its lighter coloration on the upper side and has been found in Bhutan.

Mr. J. H. Steel, A.V.D., F.Z.S., then read an interosting appear on "Indian Cattle," illustrating his remarks with specimens of skulls of the principal breeds of India.

H. B. del.

Mintern Bros. Chromo lith. London.

530. ORTHOTOMUS SUTORIUS, Forst.

The Indian Tailor Bird.